ENGINEERING AND MINING JOURNAL

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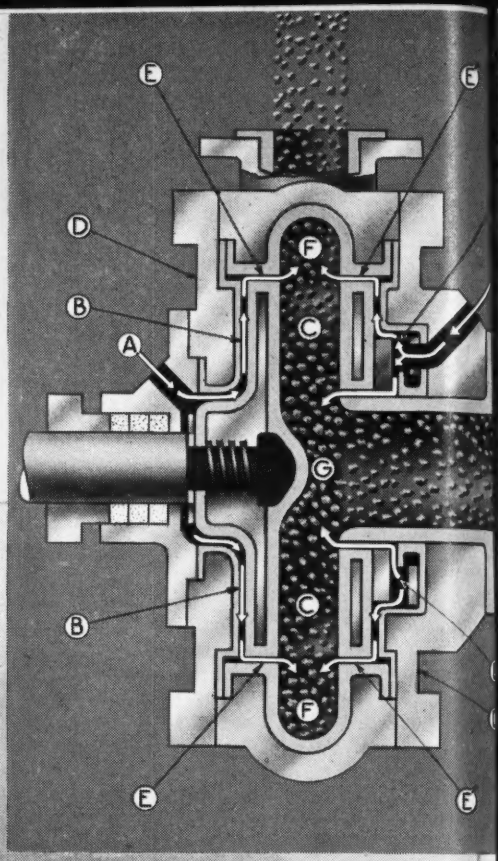
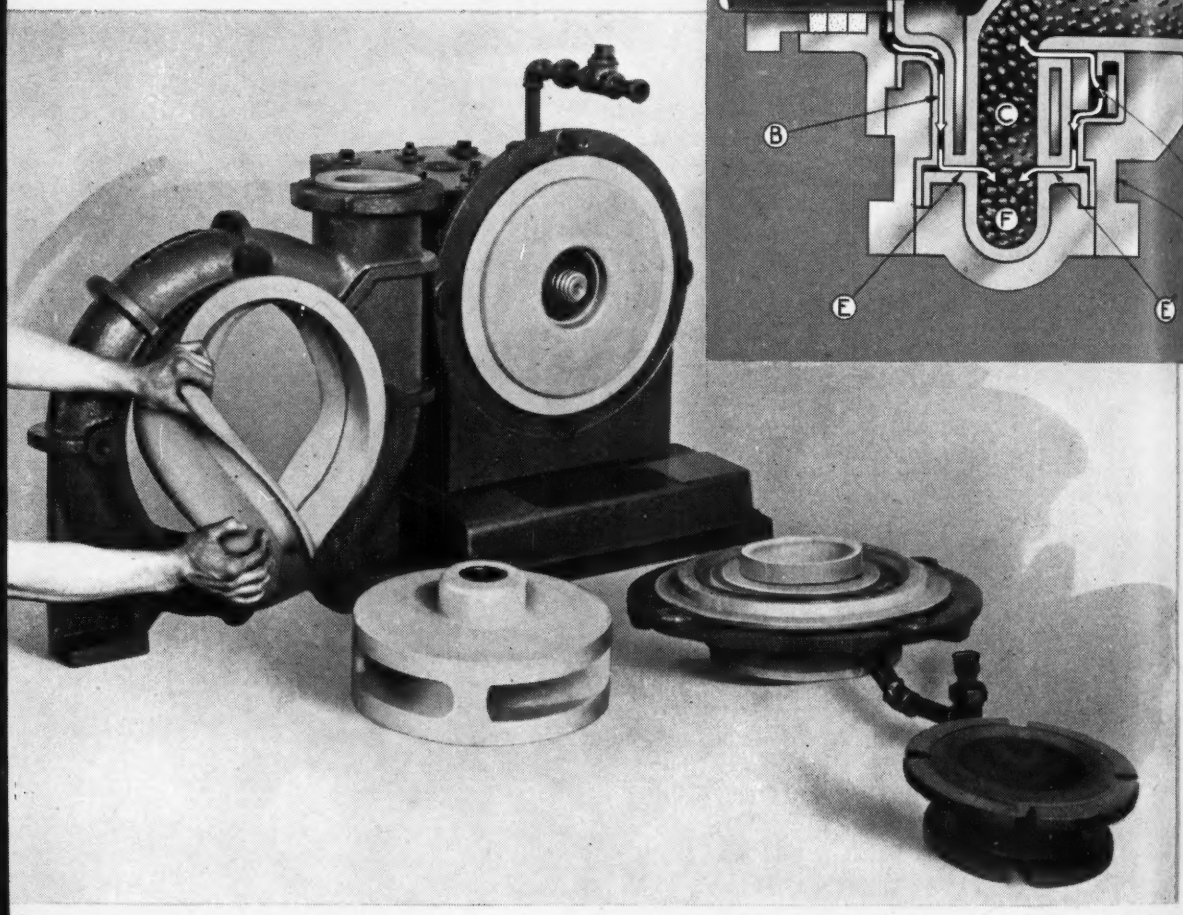
Loading an ore train on the main haulage level

A National Mineral Policy PAGE 86

Down to Brass Tacks *about why You Should Buy* HYDROSEALS





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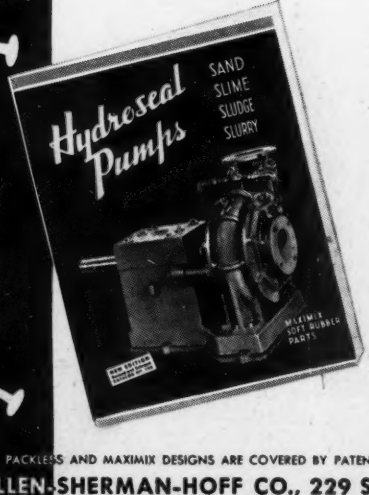

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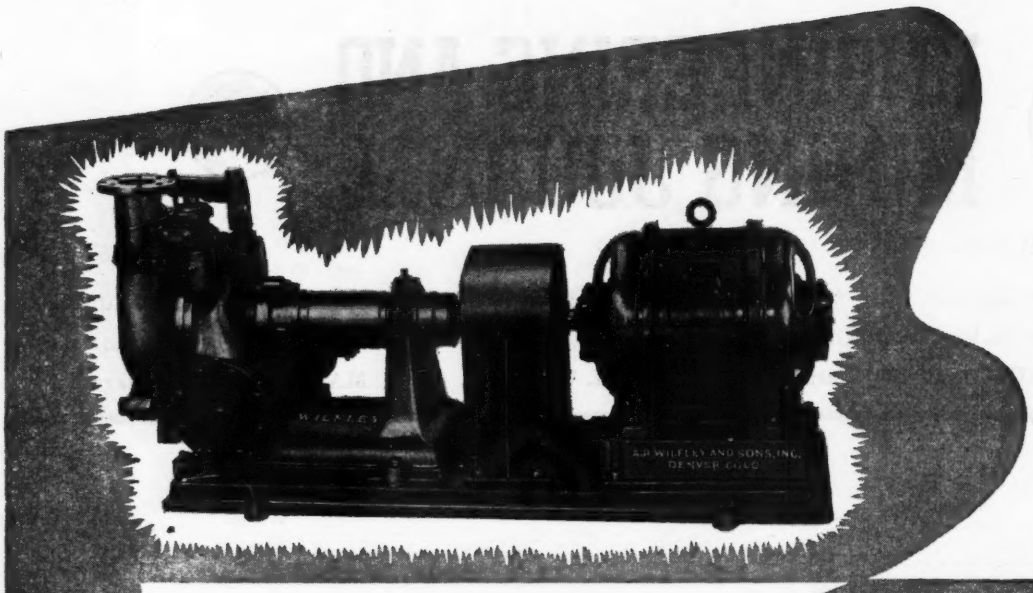

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AMERICA WANTS PROSPERITY

A BOOK to be published early in April by the McGraw-Hill Book Company carries the provocative title "Prosperity: We Can Have It If We Want It." Its authors, Messrs. Shields and Woodward, state in vigorously challenging terms their conviction that the United States will emerge from war with human, material and technological resources adequate to provide a nation-wide standard of living unprecedented in world history. They present, too, their formulation of the several policies and procedures which must be followed by government, business, and labor if we are to realize our potential for a high and sustained prosperity unmarred by prolonged periods of severe unemployment and business stagnation such as have haunted our economic past.

The specific proposals set forth will elicit both enthusiastic acclaim and acrid dissent, for the book deals in far from gentle fashion with many of the currently fashionable panaceas for assuring prosperity by magic formula. It examines, and discards as effective guarantors of prosperity, whatever their individual merits upon other grounds, programs for public works, slum clearance, subsidizing of small business, foreign loans, social insurance, deficit government spending, redistribution of income, the numerous formulae for monetary management, repeal of the anti-trust laws, or any of the loosely-phrased admonitions that government should do nothing and allow everything to take its course untrammeled by controls of any kind.

On the positive side, the book urges clear recognition of the fact that prosperity, under a system of business enterprise, depends primarily upon the existence of competitive incentives that spur capital investment to provide better tools and equipment, that improve organization and technology to insure continuously increasing productivity per man-hour of work, and that enlarge markets by producing what the consumer wants at lower prices to the end that real incomes may be increased.

In short, prosperity depends upon profitable and expanding business and employment opportunity, so it becomes the part of enlightened government, business, agriculture and labor policy to promote those measures which will forward rather than retard the major aim of expanding production.

However great the room for dissent upon the adequacy, or the phrasing, of the specific recommendations it makes, the approach of this book has one virtue of solid merit. It attacks positively the problem of what steps should be taken to achieve and hold prosperity rather than merely devising a poultice to be applied when and if we run into a decline.

Virtually all responsible spokesmen for government, and for business, labor, and agricultural groups, are agreed upon the goal of prosperity. Moreover, they agree that, insofar as possible, it should be achieved through the effort of private enterprise, with government intervention utilized only as a last resort. But despite this unanimity, almost all public discussion of the problem has concentrated upon the nature, the extent, and the timing of such government expenditures as may be found necessary to combat deflation. Since upon this question there is far from general agreement, our procedure has created an exaggerated sense of divergence in a field in which, so far as fundamentals go, we all are in accord to quite an unusual degree.

☆ ☆ ☆

No confusion should be caused by the fact that the generally current phrase for prosperity is "full employment." The latter phrase merely states the goal in terms of human values, which are good terms in which to state any goal. What matters is that we generally are agreed as to what we mean when we say that we want prosperity or full employment. Not only do we know what we mean, but within very rough limits we can give dimension to our concepts. There are a few whose appraisals are somewhat lower, but most competent estimators set the goals for about 1950 at an average annual employment in civilian jobs of between 55 and 57 million persons, with a gross national product of between $185 and $200 billion measured at 1943 price levels. This contrasts with the 1944 level of non-military employed of 51½ million, and a gross output for the end of 1944 of over $200 billion. It assumes a reduction of the average workweek to 40 hours.

It will take some such levels as these to provide employment for those who seek work, with only sufficient "frictional" unemployment (those temporarily listed as unemployed because of the normal turnover between jobs) to afford reasonable labor-market flexibility to both workers and employers. The non-military employment figures are generally consistent with the officially stated postwar goal of jobs for 60 million workers, since the latter figure is generally understood to be an estimate of the *labor force*, which includes members of the armed services and an allowance for frictional unemployment.

There are a number of reasons why the estimates cannot be figured more closely, and why no one can be very confident even of the validity of the stated limits. The chief points of doubt in the employment estimates relate to how many withdrawals there are likely to be on the part of women, oldsters, and youngsters, who now are in the labor force to a number more than 6 millions beyond normal expectancy; how many men will be retained in the armed forces; and whether the

postwar frictional unemployment should be calculated as approximating the current 1 million or the 3 million so-listed in the prosperous year of 1929. Additional uncertainties cloud the estimates of gross national product. Notable among them is the fact that no one is sure of the war's effect upon man-hour productivity trends, in view of the fact that half of our current output has consisted of products that had no substantial counterpart in our peacetime price or production series.

☆ ☆ ☆

Nevertheless, despite such qualifications, it is fair to say that we do have a general conception of the magnitude of our postwar goals. Although they are well within our production potentials as demonstrated in this war, they are formidably beyond any previous record of peacetime achievement. Only the most sanguine optimism could lead one to expect that they will be achieved without concerted will, planning, and cooperative effort. Only blind recklessness could engender confidence that once attained they will automatically be held, let alone expanded in normally healthful growth.

If we were to follow past patterns, our war-built boom would, after a period of uncertain length, collapse into disastrous depression. The very magnitude of our recent growth would contribute to the depth and duration of the subsequent trough. Yet a fall even to the level of our previous peacetime-peak-year 1939, has been estimated by The Federal Reserve Board to imply unemployment for between 15 and 20 million persons. If human values have importance, that is something that must not be allowed to occur. If business values have importance, we must not tolerate again such losses as occurred from 1930 to 1933, when sales over the four year period were $128 billion less than would have been provided if the 1929 level had held, and corporate profits declined from more than $7 billions in 1929 to an average annual loss of $1 billion over the next four years. A repetition of these things cannot be tolerated—*if foresight and cooperative effort can prevent them.*

☆ ☆ ☆

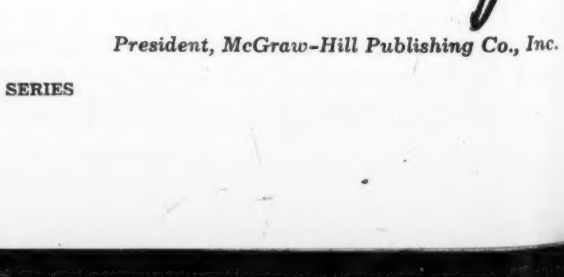
In January of this year Senator Murray introduced in the Senate a bill entitled "The Full Employment Act of 1945." It instructs the President to submit to Congress plans for eliminating both unemployment and inflation, including recommendations for correcting structural defects in the economic system. It provides for a Joint Congressional Committee to consider the proposals of the President, to take testimony from experts and the general public on these proposals or any others it may wish to consider, and after weighing all the facts to submit its findings to Congress. It provides for an advance budgeting of the constituent parts of a full-employment economy, and commits the Federal Government to provide, in advance, for sufficient expenditures (through private contractor channels) to make up for the gap between estimated private expenditures and the amount necessary to assure full employment.

By no stretch of the imagination can The Full Employment Bill, in its present form, be regarded as acceptable to business. Yet it may well present a test of whether or not American business can deal with problems in this area in a statesmanlike fashion. Such statesmanship will consist in demonstrating first, that the Bill is not acceptable because of deficiencies which preclude the possibility of its accomplishing the avowed purposes; and second, that business is able and anxious to offer constructive suggestions for remedying these deficiencies.

It is easy to point to weaknesses in the Bill. To mention only a few of major importance: The proposal to make advance Federal expenditures to compensate for estimated deficiencies in prospective private expenditures is completely impracticable. No one in the country can predict future trends with sufficient accuracy for this purpose; no one can tell what the constituent parts of a really high, *stable* peacetime budget should be, for in our boom-or-bust economy we have no stable pattern to project; no one can tell, within reasonable limits, how much the government should spend *in advance* to assure full employment. The Bill pronounces labor's right to work without defining commensurate responsibilities which it should exercise. It does not define the areas of proposed government expenditure in such a way as to allay business fears of government competition or the general public suspicion of leaf raking. Above all, the Murray Bill is defective in that, despite a somewhat vague pronouncement in favor of forwarding private business activity, it recommends a single specific designed to supplement such activity rather than stimulate it.

The very definition of certain of these faults suggests their remedies. But the positive task of stating how the Bill should be amended in order that it may have effective usefulness is far from simple. Yet it is enormously to the advantage of American business to undertake it. Fortunately, there is a representative group sponsored by industry, The Committee for Economic Development, which has for some time been working intensively upon the problem, and which is excellently equipped to offer sound and progressive advice. It should be used for this purpose.

American business cannot afford to take a negative attitude toward legislation in this field. Some legislation undoubtedly will pass, for the problem is one in which there is a grave government responsibility. But equally there is a comparably important responsibility upon all citizen groups. None of them has more to gain or lose from the rise or fall of prosperity than American business.



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THIS IS THE 34TH OF A SERIES

ENGINEERING AND MINING JOURNAL

April, 1945

Proposal for a Mineral Policy

AFTER CONSIDERABLE STUDY, we offer a basis for national policy on minerals. A sound policy, we insist, is essential to the best interests of both the nation and the mining industry. Many readers may disagree with the views expressed, some violently. However, before they decide that we would like to sell them down the river, or to serve special interests, etc., we urge them to review their own positions and decide if they are compatible with the country's broad political and economic situation and reconcilable with other legitimate interests within the mining industry.

The knottiest problem in the present picture has to do with the state of our mineral reserves and the extent to which national policy should lend artificial support to domestic production, by tax relief, import duties, subsidies, or exchange controls. In developing our position, we have paid serious attention to such views as those of Joralemon, Scrugham, Snyder, Wright, and other Western spokesmen, and have weighed them against such opinions as those of Bateman, Leith, Pehrson, and Wilson. We have consulted with a large number of leading mining men in all parts of the country, and a number of the highest officials in government. What we offer attempts to blaze a realistic trail through a wilderness of controversy. In so doing, we are primarily interested in providing a reasonable starting position for an organized effort dedicated to sound mineral policy, not in advocating any particular viewpoint.

Problems of national mineral policy are extremely complex. Recognizing that neither we nor anyone else can say the last word on these matters, we believe that wide consideration and free discussion are highly desirable. Therefore, we invite comment, either in confidence or for publication.

Postwar Planning for Northern Minnesota

COMMON SENSE prescribes that large mining communities give serious thought to their future, both because of their need for planning how they will meet the special problems of the postwar period and because each ton mined brings the day of possible ore exhaustion that much nearer. For none of them is this more important than for the towns and villages of the Mesabi iron range. Although here the taconites give promise as a future source of ore, the threat of competition from foreign ores is not to be ignored. A survey of the possibilities for continuing and increasing the prosperity of these communities is in order. To provide the funds for the necessary investigations the State of Minnesota has set aside part of the occupation tax on iron ore for the Iron Range Rehabilitation and Resources Commission, which was set up in 1941 to foster future planning.

For the difficulties which arise from dependence upon a single industry, mining, the logical remedy is to create another industry, if possible. Thought has already turned in this direction in Minnesota, where the Board of Commissioners of St. Louis County, in which most of the Mesabi lies, has proposed to explore the possibilities of utilizing the State's enormous resources of peat, estimated at almost seven billion tons air-dried, on five and a quarter million acres, amounting to half of the total peat resources of the United States. A shining example of what can be done with peat, where conditions call for it, is supplied by the Soviet Union, which generates a large part of its electric power in peat-burning plants at the bog-side, where this low-grade fuel is "mined" and prepared.

In setting about their task, the Commissioners asked the Engineers Club of Northern Minnesota and the Duluth Engineers Club to appoint a committee to sift and correlate the literature on the subject and to recommend what they think is the most logical thing to do. Peat can be used for power purposes in various ways. Likewise it has other uses for industry and agriculture. The investigation should develop new ideas that may prove of value.

Such an approach to the problem of a community's future whereby the aid of local groups of engineers is enlisted for the benefit of the community and the state can well serve as a pattern elsewhere.

New Turmoil in WPB

WE HAVE CONSIDERABLE APPRECIATION of the difficulty of Mr. Krug's position as chairman of the War Production Board. Therefore, we take no pleasure in accepting the duty of pointing out that the methods being used to resolve a difficult situation are producing a chaotic condition in the metals and minerals branches of WPB. Morale in several spots is low and likely to cause the loss of personnel whose experience and background can ill be spared.

In attempting to correct conditions where there has been some embarrassment of supply, threatened or actual, the device is being adopted of sending in a special investigator, responsible only to the top command. This agent examines the records, quizzes some of the staff, and makes a private report. Gradually he assumes a position of authority. Meanwhile, staff members and industry are confused by the development of new lines of authority without any formal cancellation of existing lines. People in charge, thus bypassed, are worried and disgruntled. They feel that they are not given a full opportunity to defend their policies. Commonly the views of people best qualified to pass judgment are not sought.

In some cases, shifts are being made which are reviving an old source of confusion and inefficiency in WPB, that of putting mine and smelter production problems in charge of people who have no background in such matters. Experience has shown that the economy of mining is so "different" that it is not adequately comprehended by "outsiders" except after long and troublesome education, even though they may have administrative talent and estimable characters. To ask outsiders to handle mining matters, particularly under pressure, is unfair to them.

In all probability, the threat to maximum mineral and metal production will be solved by the arrival of V-E Day, possibly before this statement is published. Nevertheless, WPB's work is far from ended and we foresee nothing but harm from disrupting internal morale and neglecting experience.

Sound Money: A War Casualty

NO MATTER HOW YOU SLICE IT, or how dense a fog of technical language is thrown around the process, the reduction of gold reserve requirements is a move toward fiat money. It makes us more dependent than ever on the ability and integrity of officials, against whose weaknesses a currency redeemable in gold and silver would afford security.

Having urged precious-metal producers nearly a year ago (*E.&M.J.*, March 1944, p. 64) to do something about the nation's drift toward printing-press money, we believe our warnings have been thoroughly justified by recent official statements.

In introducing the bill providing for reduced gold reserve requirements (p. 121) Senator Wagner stated: (1) that the redemption of gold domestically "is no longer compelling"; (2) that a limit on the expansion of bank credit is not "relevant" when expansion by the Reserve banks is essential to the needs of war finance; and (3) that "whether the amount of gold back of the notes is 40 percent or 25 percent makes no practical difference."

It is time to sit up and take notice when the chairman of the Federal Reserve Board states that the United States is "the only country left that still has the archaic idea of maintaining a gold reserve back of our currency"; also that "the ratio of gold stocks to the volume of currency and credit simply does not mean anything any more."

The plain fact is that, having taken the easy way of paying for the war principally on credit, we have cut loose from all checks on credit expansion. Behind a smoke screen of technical language which average citizens do not understand, finance officials are conducting an act of legerdemain wherein the government lets up on credit requirements so the banks can expand credit and buy government securities. Behind the pontifical utterances which obscure this hocus-pocus nothing is created and nothing real changes hands.

As the *New York Times* points out, the international gold standard "represented the closest form of international economic and monetary cooperation that the modern world has ever achieved," yet "now, in a topsy-turvy argument, it is the bankers who are being denounced, not as internationalists but as 'isolationists,' because they prefer a restoration of the international gold standard to a system under which each nation individually would be free to follow whatever unsound policies it wished."

We solemnly insist that the precious-metal producers would serve themselves and the public as well by undertaking a campaign to arouse popular interest in the growing vulnerability of our currency to official caprice. We are sure that if the people become aware of what is happening, they will recoil from "funny money," but that as long as officials are left alone, they will continue to conjure up new currency mirages so that the day of reckoning for extravagances can be postponed.

The formation of Western Economic and Mining Affiliates, Inc., to finance the hiring of special representatives in Washington is a step in the right direction, but the job is much bigger. A backlog of public support must be built up. The only practical way to accomplish this is to undertake a substantial program of publicity.

Reciprocal Trade Act Should be Amended

CONGRESS is considering renewal of the Reciprocal Trade Act this month. This is important to domestic mining not only because of the impact of the established reciprocal trade program, but because the bill introduced provides for power to reduce tariff levels in effect Jan. 1 of this year by 50 per cent. If this provision passes, it will afford leeway for a 75 percent reduction from the rates provided in the Tariff Act of 1930 in so far as commodities which have already been cut 50 percent are concerned. Mineral materials which have already suffered cuts include aluminum, bismuth, cadmium, chrome, ferro-alloys, iron, lead, manganese, molybdenum, nickel, and zinc.

We discussed the reciprocal trade program at some length in April 1943, and see no basis for changing the position taken at that time. In short, this recognized that the reciprocal trade program would and should be continued, but urged compliance with the plain behest of the Constitution by submitting treaties to Senate ratification. We believe that Congress is conscious of its new responsibilities and will not stoop to the log-rolling tactics characteristic of tariff action in former days. Ratification would be a check on the zealotry and double-talk which are demonstrable in past administration of the program. We recommend building a genuinely expert, impartial trade-agreement organization, which will proceed only on substantial facts. Congress should provide that a concession be made only in an agreement with the country likely to reap the principal benefit. It should require that concessions be withdrawn from nations which indulge in discriminatory trade practices, erect new barriers to trade, or depreciate their currencies. To write these conditions into the Act would simply require the State Department to live up to policies it has professed but failed to execute in several instances.

Disabled Veterans Seek Employment

WE ARE SURE that the mining industry will not be behindhand in recognizing the solemn privilege of employing disabled veterans when they become available. They are returning in increasing numbers. The fury of the conflict makes it certain that no community and very few enterprises will fail to have an opportunity to demonstrate their gratitude. For sacrifices made with such generous abandonment of self in behalf of those of us who stayed home, the proffer of a chance to earn a living is little enough.

If we fail in this simple and obvious duty to a limited and particularly deserving few, Heaven help us in the days when millions stream back from the battlefields, when millions of others must find new jobs, a shattered world must be rebuilt, and the most colossal debts in history faced. If we would avoid chaos then and the loss of all security for those dependent on us, now is not too soon to make a start by helping the victims of the hellish hand of war to rehabilitate themselves.

MILLING AROUND

Marriner Eccles, New Dealing chairman of the Federal Reserve Board, holds for a $35 billion government budget postwar. In our opinion, whether the budget is balanced or not, this level of federal expenditure would cripple private enterprise.

Again, we feel called upon to commend the intelligent leadership of Dr. Willard Dow, of Dow Chemical Co., on account of his excellent statement at the light-metals hearings (p. 120). If we had more business leaders like Dr. Dow, there would be no concern for the future of private enterprise.

In this age of tall figures, the copper industry has contributed its share since the war started. The record for the first quarter of the current year was particularly impressive; domestic fabricators consumed fully 490,000 tons, the largest on record for a three-months' period. The total tonnage consumed in the depression year of 1932 was less than 400,000 tons.

Gas or no gas, that trip through the great outdoors along the Alcan Highway, whether for prospecting or other purpose, is off for the present, unless you get a permit from the Joint Traffic Control Board at Edmonton, Alberta. To secure this you must show that you are organized and able to provide yourself with transportation, gas, oil and repairs for your vehicle, to say nothing of food and shelter, without calling upon the authorities en route.

Half of the $26 million proposed budget of the Bureau of Mines for fiscal 1946 is allocated for synthetic liquid fuel investigations. As a result of so much going to one type of activity, most of the other functions of the Bureau have had to take cuts. We cannot understand why so much money need be spent for synthetic fuels when both the oil and coal industries are technically competent and financially adequate.

A National

Why We Need One • How to Create It

A national mineral policy is needed to maintain world peace, to foster orderly, maximum utilization of our natural resources, to assure national safety, to promote equitable participation in the development of foreign deposits, and to prevent damage to domestic mining from short-sighted government action.

Sound national policy on minerals can be developed only through active cooperation between government and the mining industry. The latter must organize competent, representative standing committees dedicated to objective consideration of mineral problems.

EVAN JUST, *Editor*

Lack of Policy Endangers Both Nation and Industry

IT IS TIME for the United States to have a mineral policy. In the past, because of the generous abundance with which the nation was endowed, we have been able to "get by" without a coherent or consistent national attitude toward minerals. What has passed for mineral policy has been a mere patchwork, inadequate for our modern needs and responsibilities.

If for no other reason, a competent mineral policy is necessary because of our future role as an active participant in world affairs. That we have shed blood and squandered our national assets in two world wars is evidence that we cannot escape the world and its problems, even if we would. Should we try, it is certain that the world cannot escape us. Because of our size and power, other nations cannot avoid the impact of our activities. They must either learn to live with us or conspire to protect themselves against us.

A Menace to Future Peace

Because minerals are necessary to the economy of every nation but are unequally distributed and controlled, it is inevitable that they will enter into world affairs, military, economic, and political. Mineral problems constitute a "powder keg" in international relations, as nothing is more likely to cause a future conflagration than mishandling of the world's minerals. Nothing is more likely to start some nation on the road to international piracy than to be denied assurance of access to the minerals it needs to maintain its economy.

To have us participating in international affairs without a logical mineral policy is dangerous to ourselves and to world peace. Just as our capricious wrecking of the London Economic Conference upset the prewar world, so will uninformed decisions on minerals jeopardize future security.

On the domestic scene there is also a source of danger in an inadequate mineral policy because of the long time it takes for the effects to be felt. For example, we have been subsisting for nearly half a century with insufficient encouragement to discoveries, and still the public has been supplied with minerals at low cost by depletion of known deposits. If we wait for higher prices to foster exploration, we may experience a lag of decades before adequate reserves are built up again.

From the viewpoint of domestic mineral industries, lack of an informed national policy can be both annoying and expensive. Burdensome taxation, a repressive public-land policy, and tariff maladjustments can work serious hardships. Also, if the government stays in the business of regulating wages and prices, decisions made without full understanding of consequences can have painful results.

There have been too many instances where official decisions affecting minerals have been made with inadequate advice. To the extent that the mining industry has suffered from such developments, it can blame in part its own apathy toward public affairs. If this mode of behavior continues, we can expect to continue losing engagements by default.

Mineral Policy

• What It Should Include

Tax policies that encourage exploration and development.

Conservation through efficiency and maximum use.

A logical balance between domestic production and imports.

Modernization of protection for domestic industry.

Stockpiles for security and as economic cushions.

Enlightened participation in mineral cartel activities.

Improved government service to American operations abroad.

A public-land policy that fosters development.

Mining Industry Must Organize to Insure Wise Policy

If the thesis is accepted that a competent national mineral policy is a necessity for the future, it is unthinkable that the task should be attempted without vigorous participation by members of the mining industry. Experience has demonstrated many times over that people not actively engaged in a given industry are unable to give its problems proper weight. Admittedly men "on the firing line" in industry frequently magnify their problems; thus sound national policy needs the attention of people whose views are not colored by competitive or "bread-and-butter" influences. Nevertheless, the fact remains that a mineral policy will not be competent unless it thoroughly sifts and weighs the opinions of industry men.

If this necessary job is to be done, and done right, it requires organization. This is partly because the views of individuals do not command much official attention, particularly when the individuals have selfish interests at stake. Also, no individual, unless he is a duly accredited spokesman, can effectively pretend to voice the considered attitude of an entire industry.

The mining industry, in terms of numbers employed, is small in comparison to its national importance. Also, it has special features to its economy, largely due to the wasting nature of its capital assets. These features are not shared by the big industries, such as agriculture, manufacturing, transportation, distribution, and service, which, by virtue of the numbers engaged in them, command due attention in Washington. Because of its small size and poorly understood economy, mining is constantly on the defensive in the national arena. This situation is evident today in the extent to which current official thinking on postwar trade problems emphasizes the interests of manufacturing and distribution, and is preparing to sacrifice the mineral industries thereto. To be heard in proportion to its actual importance, the mining industry must organize standing committees that will develop and express its views.

New Type of Leadership Required

If any organization undertakes to assist government effectively in formulating national mineral policy, it not only must adequately represent the various groups composing the mining industry, but it must acquire the reputation among policy-making officials of viewing national problems objectively. It cannot mix selfish or sectional interests with the objective treatment of national problems without serious risk of falling down on one or both of these jobs.

Admittedly, it is asking a good deal to urge the various elements in a great diversified industry to organize for objective consideration of problems whose solution in the national interest may at times be injurious to themselves. This is asking nothing less than a radically different pattern of behavior, a genuine break with the traditional approach. However, the reason why we must develop a new type of behavior is compelling enough to demand serious attention. It is simply that we shall either learn new means of effectuating peace and progress, or, possessed of the frightful, destructive powers which technology has placed in our hands, we shall demolish civilization.

Beyond our individual stakes in living decently rather than being blasted into oblivion, there are other selfish reasons for objective collective action. If we perceive

self-interest in adequate perspective, we will realize that no industry or segment thereof can operate contrary to sound public policy without getting itself into difficulty. The possibility that hardship may be created at times for some producers if they acknowledge that the interests of the nation are contrary to their immediate objectives is not a valid reason for unwillingness to enter into the formulation of national policy. Decisions must be made, and if informed people fail to help make them, they will be made without full understanding of the consequences. Certainly there is more danger to business interests from having their destinies ruled in ignorance than in policies guided by the objective application of informed judgments.

Object: to Integrate Interests of Industry, Nation, World

To discuss any kind of domestic mineral policies is more or less academic if the industry cannot look forward to substantial relief from the crushing tax burdens it now bears. Continuance of current taxes will simply annihilate private enterprise in mining, as there is no reasonable possibility of gain by assuming the risks of mine development in the face of taxes the industry now pays.

Tax Relief Is Necessary

However, we are all aware that the same fate will await private enterprise in general unless substantial tax relief is obtained. The sinister impact of Uncle Sam, the tax gatherer, is currently cushioned by the fact that he is all industry's big wartime customer and spends twice as much as he collects. After the war, when industry must go back to ordinary customers, even going businesses will be hard pressed to pay half the present tax bill. The drop in government purchases at such tax levels—given a balanced federal budget—will be about equal to the entire national income in 1940. Maintenance of present tax rates would make new business risks of any kind sheer absurdities.

Because the minimum taxes that can be expected will be very serious burdens, we can anticipate a general clamor for tax reductions. Therefore, the mining industry will find stubborn resistance from a harried Congress to its requests for special relief.

Nevertheless, the low rate of mineral discovery, particularly of important new mines and districts, is a matter for serious national concern. In the public interest we believe that important new incentives must be furnished to stimulate exploration. Under the circumstances that will probably prevail, it will take united, vigorous action by the mining industry to convince Congress of this need.

Beyond maintenance of present depletion allowances, two things are needed to stimulate mineral exploration and development. One is downward revision of the capital gains tax. The other is a three and one-half year exemption from income taxation for all new mining ventures. The latter is not a wild idea. It was actually practiced in Canada before the war and was successful in producing the desired results. The exemption not only stimulated prospecting to a noteworthy extent, but income from the resultant productive operations actually increased total tax revenues. If Canada, whose mineral reserves are far less depleted than our own, found it profitable to grant such tax relief, it would be even more appropriate here.

Conservation Through Efficiency

The mining industry will be very foolish to underestimate the movement which sponsors the idea that we have become a have-not nation in minerals, and should apply drastic conservation measures to those that remain. This viewpoint stems from people engaged in manufacturing, and has effectively penetrated Washington economic thinking because most officials and economists understand manufacturing but not mining.

People sensitive to manufacturing and distribution problems, who are trying to piece together a postwar pattern which affords hope, almost universally conclude that we cannot have high employment unless exports are greatly increased over prewar levels. They have also become aware that we cannot have healthy foreign trade unless exports and imports are more or less in balance. It never occurs to them that their own industries might logically bear a portion of the burden of increased imports. Thus the idea of have-notism in minerals and of balancing manufactured exports with mineral imports dovetails beautifully into their picture, and even affords some hope of obtaining raw materials at lower cost.

As we have already stated (*E.&M.J.* Feb., p. 91–92), the idea of balancing the desired level of exports with mineral imports is probably a practical impossibility; nevertheless, we are certainly going to be asked if the nation can afford to continue rapid depletion of essential mineral resources whose economic reserves seem to be less than our total needs for the next 20 or 30 years. As the group most competent to pass on this problem, we have a duty to provide an answer based on a national viewpoint and aimed to cover all reasonably possible national risks.

Those of us who are versed in the mineral industry know that the popular view of our state of have-notism is grossly distorted; but common sense forces us to realize that our self-sufficiency seems to be facing its declining years. This is particularly so because our consumptive requirements are still increasing. We cannot shrug off the declined rate of discovery and we all know that mines, tenacious as they are, eventually play out.

Nevertheless, after weighing the probable consequences of various means of conserving mineral resources, it is our judgment that the truest conservation lies in orderly and maximum utilization. The idea of locking minerals away for future need by killing off the extractive industry has three important flaws: (1) Given adequate time, modern technology can find substitutes for any commodity; (2) It takes a "going" industry to make the technical and managerial gains which enable economic utilization of lower and lower grades of ore. The pilot-plant scale of operation is not adequate to achieve this result to an optimum extent; (3) The emergency needs for which "lock-up" conservation would presumably be practiced cannot be met without established plants and trained personnel.

We must also recognize that the cure will be worse than the disease if a sudden change in the rate of production disrupts either a great industry or important segments of the country. Obviously, the region most affected by drastic conservational policies would be the mining West. The people of the West have a right to expect stability of their economy, and population growth rather than decline. Thus, it would be unfair to injure their established industries until others arise to employ their people and sustain their economy.

Furthermore, considering only the selfish interests of the manufacturers and distributors who have a stake in low-cost raw materials, it would be suicidal to jeopardize the important established markets of the West in order to facilitate trade with people to whom an old oil tin is a precious utensil. The development of foreign backward areas into important markets for American consumers' goods is bound to take many years, if not generations. How will the manufacturer whose established market is injured meet his payrolls meanwhile?

Another aspect of the conservation problem is that of the marginal mines. Certainly, it is fruitless to hope that the public will pay the price necessary to keep in operation all the mines brought to life by wartime demands. Nevertheless, there are some which in the public interest should be kept open and maintained, if not operated, on the assumption that their resources will eventually be needed, and rehabilitation after abandonment would be an expensive alternative. The problem applies not only to wholly uneconomic mines, but also to marginal parts of better mines, where normal operations might leave poorer portions inaccessible. Naturally, each property is a separate case, and the sifting of cases which warrant a subsidy is an appropriate subject for consideration by a committee as suggested above.

In short, we believe that a logical conservation policy will aim at scientific research, operating efficiency, active exploration, and effective use. These alternatives offer more opportunity for maximum development of mineral resources and national safety in case of emergency than "lock-up" conservation. True, the latter would assure a limited reserve, but the same would not be quickly available. Also, such a policy would stifle the processes which have made available most of the minerals we have consumed in the last several years.

Logical Level of Imports

We shall be short-sighted indeed if, preoccupied with our own peculiar problems, we fail to keep in mind the impossibility of divorcing the well-being of mining from that of the nation as a whole. More specifically, as producers we cannot prosper if the people who buy and use minerals are in distress. Also, it is generally conceded that as a nation we cannot enjoy good times if the rest of the world suffers from economic depression. Therefore, intelligent self-interest demands that we concern ourselves with the nation's economic problems and lend ourselves to their solution. The same motive also compels us to lend a hand in the solution of world problems.

Considering the national picture, we can hardly escape the fact that virtually all business men and economists who have sought the means of attaining postwar prosperity agree that we cannot sustain a high level of production without much more foreign trade than in any peacetime years. It is also understood that the industries which will be most dependent on export outlets are the capital-goods industries. If we resist efforts to expand trade, and thus succeed in strangling capital goods production, where are we going to market a satisfactory mineral output?

Inasmuch as we shall have a postwar capacity to produce from one and a half to twice as much as we produced in 1940, it is evident that we are going to have either an unprecedented level of peacetime activity or else mass unemployment that will shake the foundations of the private enterprise system. If the latter alternative develops, we shall have problems that will dwarf any concern over imports. If, on the other hand, we enjoy high employment—and the world prosperity necessary thereto—consumer demands are likely to tax the world's developed mineral resources, including our own. In brief, intelligent self-interest demands that our industry should accept part of the burden of increased imports.

However, this does not mean that the mining industry should be sacrificed in behalf of manufacturing interests. These interests must expect to bear their portion of import competition, partly because serious damage to domestic mining will be injurious and dangerous to the country, and partly because it will probably be physically impossible to balance the exports they desire except with a diversified list of imports, including manufactured and agricultural products.

One circumstance which most people fail to take into account is that the rest of the world is hardly prepared to flood our markets with minerals. World production before the war was approximately in balance with consumption. Much of it was artificially subsidized by nations preparing for war or in distress for foreign exchange. Wartime foreign depletion has been much more rapid than development, and much equipment is badly run down. Also, foreign production costs have risen, in many cases more conspicuously than here.

Moreover, foreign national policies may place definite restraints on mineral exports. For example, the British are a farseeing race and will not be anxious to gut the mineral deposits they control in the next few decades, leaving themselves overly dependent on the Western Hemisphere thenceforward. The Russians view minerals as state property and are probably more interested in developing them for their own future use than in dissipating them all over the earth in trade, as we have done, often for nothing but bad debts in return. Most Latin American countries are just as much interested in taxing mineral outgo heavily and in building up their own self-sufficiency as they are in shipping cheap crude minerals to us. China and India are hoping to build up their domestic living standards. If they succeed even partially, they will probably be net importers of minerals on a considerable scale. Therefore, particularly considering reconstruction needs, it seems possible that we may have competition for most of the minerals this country seeks to acquire from abroad.

To summarize, considering the anticipated high level of domestic mineral consumption, it will probably be feasible to maintain our prewar level of domestic mineral production and accept an increased flow of mineral imports as well. A balance on approximately this basis would be wise national policy, correlated with the principle that any indicated changes should be made slowly, in order to avoid hardship in making adjustments.

Tariff Outlook Puzzling

The one argument in support of tariff that is indisputable is that it bolsters national self-sufficiency. The latter is a safeguard against a national emergency or international conspiracies to make us pay excessive prices.

If we wish to support self-sufficiency—which, throughout our national history, we have always sought to do—then some special protection must be given to several branches of domestic mining. We know that the average grade of foreign ore deposits is much higher than our own; also that no matter what restraints may be placed upon the flow of goods, it is impossible to embargo knowledge. In other words, scientific discoveries, engineering talent, skilled manpower, and modern machinery are and will continue to be available to anyone in the world who has the ambition to acquire them. Therefore, except to the extent that we benefit by superior transportation facilities within this country, the foreign producer, working on richer ores with cheaper labor, enjoys

an advantage which we can overtake only by charging another group of Americans, the consumers or taxpayers, for tariff protection or other subsidy devices.

It seems certain that until the fear of war is finally removed and the principle of "equal access to the trade and raw materials of the world" is firmly established, all nations, our own included, will seek to bolster their self-sufficiency. Therefore, as long as moderate charges against consumers or taxpapers will accomplish this, we can expect public support of mineral protectionism. However, it would be illusory to presume that we can enjoy protection ad infinitum or even beyond the point where the cost becomes burdensome.

Apropos the quest for self-sufficiency, it should be kept in mind that our newly adopted policy of stockpiling minerals tends to reduce the need for protection. In other words, to the extent that we meet possible emergency needs by stockpiling, these needs will not require the artificial support of domestic mineral production.

Those branches of the mining industry which depend on tariff protection are in a puzzling dilemma. Their costs have mounted considerably during the war, and it seems likely that much of the increase will be retained. We know that foreign costs have also risen, but in those places most likely to offer us competition, labor is probably not as well organized to protect its gains as is the case here. People who face actual want are not likely to deny themselves sustenance if their employers are not in a position to offer more. Therefore, when competitive trade is resumed, tariff-dependent industries will probably need more tariff protection unless world consumer demands are lively enough to narrow the gap between foreign prices and domestic production costs.

What chance is there of obtaining such additional protection after the war? The national drift for ten years has been toward reducing tariffs. Some minerals have already suffered duty cuts. On every hand people are talking more international trade and abolition of barriers. Unless there is a definite about-face in public thinking, it seems hopeless to plan on tariff increases, or even on retaining present margins of protection. Even if there is an about-face, our status as a creditor nation will scarcely permit us to live with an isolationist philosophy. The most a protectionist can expect under the present outlook is that reductions of tariff will be gradual.

However, a gradually declining margin, or even a static one, fails to meet the needs of protected domestic mine operators. They must not only shoulder higher costs inherited from the war period, but must anticipate constantly mounting costs as depletion of their properties advances. In other words, preservation of the status quo would be a hollow accomplishment. Furthermore, the pressure against tariffs is bound to grow if the nation becomes more and more dependent on imports.

New Protection Formula Needed

Thus, it seems that some new tariff formula or subsidy device is indicated. To meet the changed national attitude and trade outlook it must reduce the average total of tariff protection. To meet cases where self-sufficiency is declining or already slight, it must avoid adding needless costs to the logical amount of imports; otherwise consumer resistance will be encountered. To meet the widening differential between foreign and domestic production costs, it must afford larger margins of protection.

Although these apparently contradictory objectives are impossible to attain with the type of protection to which we are accustomed, there are alternative routes to their achievement. The most scientific way would be to substitute direct, tax-supported subsidies for mineral duties. Such a system would have the following advantages: (1) It would afford protection to domestic producers without taxing consumers on the imports which flow in anyway. (2) The total burden on trade could be reduced by relieving imports of duty, even through the margin of protection afforded domestic producers were maintained or increased. (3) It would not jack up domestic wages and prices needlessly in comparison to those abroad. To the extent that higher wages are offset by higher prices, the standard of living is not improved, and the dual increase simply throws our economy out of gear with the rest of the world.

Outside of the difficulty of gaining acceptance of any radical departure from established practice, from the producer viewpoint there are two possible disadvantages to abolishing import duties in favor of direct subsidies: (1) Because tariff operates as an "invisible" tax, it is accepted with less resistance than a tax-financed subsidy would probably receive. (2) A direct subsidy would improve the opportunities of social theorists to set up discriminations between beneficiaries.

Objections to Quotas

Another route by which the objectives mentioned could be reached is through import quotas. These could be used to reduce the duty on a designated rate of importation, thus also lowering the total cost of protection, while maintaining or increasing the barriers to over-quota imports.

With a desire to help the mining industry find a constructive solution to its tariff problems, and to do so before the industry finds itself in new controversies, I have consulted with a number of industry leaders, West and East. At these meetings the direct-subsidy alternative was not discussed, in the belief that such a radical departure from established practice was probably unattainable. The quest was narrowed to searching for a quota system that would be practical and acceptable. As such, it was unsuccessful. Basking in the sunshine of wartime demands, most miners and smelters are not sufficiently worried over their future to get excited over postwar tariff. Also, most smelters have no enthusiasm for an arrangement which would upset the present cost relationships between competitors. Any quota arrangement that prevents smelters and importers from calculating costs in advance is objectionable. This is particularly true if the system involves delayed adjustments to equalize the effect of differential duties. The same objection holds if a reduced concentrate duty is distributed as a domestic subsidy,' in an effort to lower average duty but raise the margin of protection afforded to domestic miners and smelters.

Many producers are disinclined to seek a new protection formula. They either do not share my opinion that the status quo will be inadequate, or they seem to think that there will be no great difficulty in securing tariff increases based on what they consider a suitable showing of facts. In my opinion, this confident attitude fails to account for changed public and official viewpoints or the rigidity of official minds. We have had ample opportunity in recent years to observe the tendency of officials to ride out mistakes rather than admit errors.

Mineral Stockpiles

Stockpiling of minerals, already widely endorsed throughout the mining industry, and approved by Congress, actually has three separate aspects. These are: (1) assurance of adequate supplies for a future emergency; (2) preventing the impact of war-generated

surpluses from demoralizing domestic mining; and (3) affording a means of collecting some foreign debts or building up foreign credit through mineral shipments without injuring domestic mining.

The first of these aspects has already been widely discussed and accepted; we would simply add that any logical requirements to meet a future emergency will probably be much larger than most people realize, partly because war's material needs mount constantly and partly because our self-sufficiency will probably be lessened as time passes. We believe that military requirements, properly determined, will pretty much cancel the possibility of industrial demoralization by absorbing most present and potential surpluses. In any event, the right of an industry which has contributed so bountifully toward victory to assurance against being swamped by the fruits of this effort can hardly be questioned. However, we are asking for trouble when we request that any actual surpluses over emergency needs be stockpiled permanently, rather than to be disposed of in judicious and orderly fashion.

As stated above, the expectation is probably fantastic that our willingness to accept mineral imports would cascade a flood in our direction. In any event, if it is possible to collect foreign debts or facilitate desirable trade by importing minerals in excess of current needs, there is no reason why such accumulations should not be stockpiled until domestic markets can absorb them comfortably. Minerals can be stored indefinitely and would certainly be much better security for taxpayers' investments than any promises to pay. However, as Charles Taft, of the State Department, recently stated before the Colorado Mining Association, the acceptance of minerals in payment for debt will not provide foreigners with dollars to purchase American exports.

In case of any government-held surpluses, the industry should stoutly insist that if sold, disposal should be prudent and orderly, and only at such times as markets can comfortably absorb the contributions.

Mineral Cartels

Nothing could be more illustrative of the confused state of our national economic policies than the current attitude toward cartels. An enormous backlog of public disapproval of cartels is being built up by both officials and private citizens, despite the fact that we shall probably have to live with mineral cartels whether we like them or not. Also, the same government which is crusading violently against cartels enforces cartelization of the domestic coal, petroleum, and agricultural industries, and has only recently entered into an international compact over Near Eastern oil.

It must be admitted that cartelization, properly administered, can contribute both toward industrial stability and toward conservational operations. These have been primary objectives of some mineral cartels and of the petroleum and coal regulations in this country. The difficulty of shutting down or reopening mining properties to meet fluctuating demands causes an inevitable trend toward controlled production and the use of buffer stocks. Undoubtedly the world's minerals could be produced most cheaply over the long pull by stabilized operations. Also, the impact of unemployment in one industry on the markets of another has led to attempts to stabilize employment in general. This trend is so universal that there is little reason to look for it to stop growing. Thus, we have little hope of living in a world without mineral cartels.

The practical alternatives are: shall we drive them beyond our influence by opposition, or shall we by participation try to clean them up and make them serve consumers as well as producers? Mineral cartels will be inevitable if any plans are laid to prevent belligerently inclined nations from accumulating the supplies necessary to make war. Nobody knows at the present time what steps may be taken in this direction.

Without undertaking to defend cartels on principle, we believe that mineral cartels are going to exist and that we would do well to learn how to live with them.

Improvement of Foreign Policy

The changed attitude toward foreign trade and the accelerated activities of American mining companies in seeking foreign opportunities are assurance that American interests will be more heavily involved in foreign operations than ever in the past. These conditions and official utterances all point to a departure from Uncle Sam's traditional indifference toward the fate of American enterprises in foreign fields. Probably the arbitrary expropriation of American property by foreign governments is a thing of the past. Also, our commercial interests will no longer be left to founder in the face of competition by people whose governments give their trade diplomatic support.

In the exploitation of our own minerals, we have permitted citizens of other countries to enjoy the same rights and privileges as American citizens. Some nations whose people have benefited by these opportunities do not grant Americans the same rights as their own nationals in the development of minerals under their control. Certainly, it is proper for our government to insist on reciprocity in such matters.

The counsel of our mining industry is desirable and will no doubt be welcome in meeting such problems as: prevention of discrimination against American capital in developing foreign mineral deposits or in purchasing foreign minerals; prevention of arbitrary expropriation, excessive taxation, or burdensome regulation of American-owned foreign operations; overcoming foreign exchange handicaps; and improvement of diplomatic and commercial attaché services.

Mineral Location Rights

There is already widespread concern in the mining industry over the tendency of some officials to restrict mineral location on public lands. Mining men have no clear idea to what extent this movement is based on an honest desire to correct defects in public land policy, or simply cloaks an official desire to hamstring private enterprise in mining. It would be beneficial if some representative committee would study the facts of this situation, and be prepared to take a constructive position on such affairs as the uproar in Alaska over the Interior Department's move to set up large Indian reservations.

An organized effort to study and improve public land policy would certainly be better than the present situation, whereby each affected segment of the industry fights and usually loses a local rear-guard action against organized and persistent encroachment. Also, the industry would be in a better position to resist if it would take steps toward eliminating abuses of the present system. All collective efforts concerning assessment work have been toward reducing or eliminating this obligation. Under emergency conditions there is some excuse for this, but in its own and the public interest the industry should not continue to make it easy for people who do not intend development to hold claims year after year. Also, the present system has permitted people to pasture livestock or cut timber on public lands while holding them under pretended mineral claims.

Women Workers at Flin Flon Aid Record Zinc Output

JOHN D. CARR, *Superintendent of Zinc Plant, Hudson Bay Mining & Smelting Co., Flin Flon, Man.*

To KEEP the Flin Flon electrolytic zinc plant at peak production, as it has been since the war began, gaps in the operating personnel caused by men leaving to join the armed forces have of necessity been filled by women. At present almost two in every five on the payroll are women, and the male employees remaining are too few to handle the essential jobs. The employment of women has made it possible to maintain the highest overload peak which the equipment and process can carry.

Early in 1942, as the losses to the services steadily increased, it became evident that some action was imperative. A trip was made that spring to see what the situation was in other electrolytic zinc plants. In two of them it appeared that the opposition of the employees would prevent the hiring of women. In a third plant, there was but one female employee, in a clerical capacity, and there was no provision for hiring more.

IN THE ZINC PLANT, which is operated continuously, two out of every five employees today are women. Here on the Moore filter in the leaching division are the operator (right) and helper on one of the shifts.

Three Problems at Outset

The staff of the zinc plant, which is operated by the Hudson Bay Mining & Smelting Co., had had no previous experience in the supervision of women employees. It faced three problems:

First, the Flin Flon area, in northern Manitoba, is isolated and small, with a population of 8,000 to 9,000, and it was doubtful that a sufficient number of women would apply for work.

Second, with few exceptions, none of the women of the camp had had experience in industrial work. Could they and would they accustom themselves to relatively hard work, most of which was on a three-shift basis?

Third, old provincial statutes prohibited the employment of women excepting in a technical, clerical, or domestic capacity.

All of these obstacles were overcome. Legislation was revised to permit women, not under 18 or over 48 years of age, to be employed on certain carefully selected jobs for a period to terminate at a time not exceeding six months after the cessation of hostilities. Many of the employees told their friends on farms and in villages to the south that war-work jobs for women were available, and soon the supply became reasonably adequate. With comparatively few exceptions, the women adjusted themselves to the working conditions and, within their capabilities, they fulfilled all requirements.

Plant policy was established with a major premise for applicants' qualifications, jobs and controls, and rates of pay. The applicants were classified as follows: (1) Those with husbands in service. (2) Those with dependents to support. (3) Single girls. (4) Wives supported by husbands working in the plant. It has not been necessary to employ more than three or four in the fourth classification.

The jobs chosen were in a category of comparatively lighter work. In a number of cases the work was reallocated or the jobs were revised so that they could be handled efficiently by women. They comprised 25 separate jobs, 16 of which required just one employee on each shift. These have to do with part of the process control, such as the

ON THE FILTER PRESSES in the leaching plant, as well as elsewhere, women have proved able workers. Two helpers here are starting to clean a press.

CASTING in the cadmium plant, which is part of the zinc unit, is one of the 25 different jobs which have been selected as suitable for women.

operation of ball mills, Dorr thickeners, Moore filters, Shriver press filters, electric slab-loading trucks, slab-zinc weigh scales, and sampling and equipment maintenance work including aluminum welding, oiling and rubber application, and repairs.

For the first year or so each applicant was selected with some particular job in view. After that period each new employee had to start on one of the less agreeable jobs and work up to full capability as openings occurred. Safety clothing included specially designed coveralls and caps of substantial herringbone-weave khaki-colored cloth with fourteen big red buttons. Safety toe shoes and the like were stocked at cost or half cost to the employee. However, safe clothing of any type has been permitted.

A separate change house was provided for the women, with toilets, showers, 15x18x60-in. steel lockers, individual white porcelain lavatory basins of generous size, a domestic-type washing machine, plenty of mirrors and lots of light, and, of course, the whole kept scrupulously clean.

Plant routine regulations already in effect for men were applied practically in their entirety for women. There was one innovation in that a "women's personnel adviser," a woman carefully selected for maturity of judgment and balance, was provided on each shift. These advisers have their own office, which is equipped with an emergency bed, first-aid kit and furniture, and has attached toilet and lavatory facilities.

Inasmuch as the employees take all instructions pertaining to technical work from the foremen or shift bosses, the advisers have not required much in the way of authority. Their function has been to familiarize the new employee with the layout of the plant, with her own particular job surroundings, and, along with special plant regulations, with at least the bare generalities of established company policy. The women have taken all sorts of problems and troubles to the advisers for advice or action. Women have many more anxieties and small misfortunes than men. There have been many trifling differences and a marked tendency to take unfounded gossip seriously. It has not been necessary for any woman employee to refer directly to any man, inasmuch as the advisers can start the machinery to correct any bad conditions or unsnarl any tangle. The advisers were engaged for a month before other women so that they might have an opportunity to become familiar with plant conditions. With this arrangement, even the few women engaged at first were assimilated smoothly. Later, after the novelty had worn off, the advisers were reduced to one, on the day shift only. By their efforts with the women employees and their advice to the staff, they have prevented many headaches.

Equal Pay for Equal Work

From the beginning, the company policy has been "equal pay for equal work." There has been no hedging to get around this. As soon as the new employee has shown that she can adapt herself to conditions in the industry, which takes about 30 days, she is placed on a rate system similar to that for the men. For each job there is a definite hourly rate, and the employee doing the work is paid accordingly. Though it is true that women cannot do hard physical work, and that this harder work must be done by the remaining men employees, the men all realize that these women are the wives, sisters, sweethearts, and, in cases, mothers of the boys on the battle-fronts who are doing their best to bring victory nearer. All are also well aware that without this extra help the production-incentive bonus would promptly nose-dive to zero.

The statistics on page 94 indicate what these women employees are like and, to some extent, how satisfactory they are as employees. All speak good English. Each must pass a rather exacting pre-employment medical examination, including X-ray, and, above the Personnel Department's employment routine, each must be acceptable following an interview with the zinc plant superintendent. A very few have not measured up to the character standard set by the women employees themselves, and these have been dropped. On every count save that of industrial experience, those employed have been far superior to the average woman employed in industrial districts.

Absenteeism has not been immoderately high, as indicated in the table by the percentages of the payroll for an average period.

An electrolytic zinc plant operates on a bulky, closed circuit process. It can neither shut down nor start up in a hurry, but must operate 24 hours per day, 365 days per year, and during that time there must be an operator on each job. There is no such thing as a "No Work Today" sign. On the other hand, management must see that each job is filled on each shift. It is most important to know before the

A Statistical Picture

Average age	26.4 years
Education	8.3 years
Previous experience in	
Any industry	11.8%
Domestic only	88.2%
Married	36.3%
Average number of dependent children	1
Husbands in Armed Services	46.0%

shift starts just who will be on hand to arrange replacements.

The work week is of six days of eight hours each, with one specified "day off." Any time worked over eight hours, or on the specified day off per week, or on six national holidays, is paid for at one and a half times the regular rate. Due to wartime labor shortages, and to the outages in the summer for holidays-with-pay and farm-work leaves, some of the men have worked on their normal days off, but only when this extra work was essential to keep the plant in operation. Women, however, have been held to regular hours. The extra hours for men will be reduced to a minimum as soon as more labor is available.

Women stay out more because of sickness than do the men and have a slightly higher accident percentage. It is probable that a part of the outage reported as due to sickness was actually for other reasons. The women are working in unfamiliar surroundings with equipment and materials entirely foreign to their previous experience. A higher accident rate might reasonably be expected. Of course, all women automatically become members of the H.B.M.&S. Health Plan, under which employees and their dependents receive complete medical, surgical, and hospital care. In addition, they may join the Sick Benefit Plan, which provides personal finances at half cost during illness up to 16 weeks per year, and most women employees have availed themselves of this protection.

The holiday-with-pay plan for hourly-rate employees starts with seven days after two years of employment and adds one day for each additional year up to a maximum of 14 days. About 5 percent of the employees may be on vacation at any one time, and, within this limit, employees choose their own dates. To date, relatively few of the women have been employed for the two years required to qualify for vacations, but a good percentage will have holidays with pay in 1945.

Special leaves include those for all approved absences of over three days, other than as already noted. Ten-day leaves to attempt enlistment in the Armed Services and longer leaves for farm work account for most of the outage time for the men. The reasons given by women are much more varied, and some requests for leave have not appeared very logical. A good many special leaves are granted to women to coincide with furloughs of their husbands or close relatives.

COVERING EQUIPMENT with rubber to protect it from corrosion by acid solution is done by women in this department, which is part of the zinc plant. At the right two flotation impellers are being covered thus.

Why the Absentee?

	Men	Women
Number working, %	80.2	77.6
Absent, %		
Regular day off per week	10.2	13.1
Sickness	2.1	3.0
Accidents	1.0	1.1
Vacation-with-pay	2.9	0.2
Special leaves	2.4	3.9
A.W.O.L., etc.	1.2	1.1
Payroll	100.0	100.0

The A.W.O.L. percentage includes the time lost when an employee fails to notify the plant in advance of absence and any time lost when an employee returns from an absence without notifying the plant, in which case another employee will have been placed in the job for that shift.

Turnover Larger

Labor turnover has been much higher with women than with men, mainly because they must assume much greater responsibilities at home. Some mothers have been forced to quit because no adequate help was available to care for the small children. Some have been recalled to farms when brothers left for active service. Others have found it too much to try to hold down a job and at the same time take care of a home and family. Regardless of wage rates and working conditions, a heavy turnover appears inevitable.

No violent dislocation from postwar reconversion to a strictly male status is anticipated. A large percentage of the women employees have been placing their surpluses in War Bonds and other savings with definite plans to return to their normal place in the community.

This plant has succeeded very well using the practical maximum number of women employees. For other plants that are short-handed and are contemplating employment of women, we recommend that they first find two capable women advisers for staff advice and counsel; next that they purchase a large bottle of aspirin for small daily headaches, and then, stop worrying about production.

Facts Sought on Reserves of Cartersville Manganese

BURTON M. REYNOLDS, *Mining Engineer, U.S. Bureau of Mines*

PRODUCTION OF MANGANESE ore in the Cartersville (Georgia) district is expected to show a material increase during the latter half of 1944, largely as a result of exploratory drilling by the Bureau of Mines. The expected increase will be, for the most part, from the operation of a new producer and from the expanded operations of one company that is already an active producer.

The Cartersville district is a comparatively old field, and its history is one of sporadic production. Manganese ore was discovered near Cartersville in 1859, and shipments were first made in 1865. Since that time about 185,000 tons of manganese concentrates, 240,000 tons of ferruginous manganese ore, and not less than 52,000 tons of manganiferous iron ore have been shipped from the district. Peak production was reached in 1930, when 19,000 tons of ferro-grade ore was produced. Since 1932 the district has been declining gradually in importance, owing to the exhaustion of known orebodies as well as to the fact that operating companies have not developed ore reserves ahead of mining operations.

Manganese-bearing deposits are erratic both as to size and manganese content. The ore occurs as pebbles and boulders of psilomelane in the soil and residual clays derived from the weathering of sedimentary formations. Overburden ranges from a few inches to 200 ft. The deposits are found in a belt about 18 miles long and 2 miles wide that trends northeast from the vicinity of Cartersville to beyond the village of White, Ga.

The possibility of finding a large reserve of manganiferous ore in extensions of known deposits and of discovering new deposits led the Geological Survey and the Bureau of Mines to make an intensive study of the district, and the results of the investigation encouraged the Bureau of Mines to conduct an exploratory drilling program which was started in March, 1943.

The White Manganese Co., a new organization, began production in May 1944 on a property formerly known as the Pauper Farm, about 10 miles northeast of Cartersville. The deposit was worked during the first World War but had been idle since that time because of the lack of known ore reserves. Recent exploration by the Bureau has indicated new ore that has brought the property back into production.

The Neel & Neel Mining Co., operating manganese properties a few miles south of the Pauper Farm area, has been a substantial producer for a number of years. Activities at the company's Bufford Cut mine were abandoned recently because of excessive water, and operations have been transferred to the Will Lee mine, where a drilling and trenching program was conducted by the Bureau of Mines during 1943.

Mining follows a generally accepted method throughout the district. Bank ore is loaded by power shovel directly into dump trucks and is transported to a washing plant near the mine. The present method of handling the ore at the White company's property is an innovation in the district. The ore is being stockpiled between the pit and the washing plant, so that control of the feed to the washer can be made independent of the mine production.

Beneficiation of the bank ore is a comparatively simple process involving low capital cost and operating expense. The process comprises log washing, screen sizing, hand-sorting, and jigging. Recovery of the total manganese content is low on account of the loss in the fine sizes. Laboratory tests by the Bureau of Mines have proved that much higher recoveries can be made and that higher-grade concentrates can be produced by flotation followed by roasting and magnetic separation. The lack of a large ore reserve, however, has limited the individual operations to low-cost installations.

The encouraging results of the exploration work done to date by the Bureau of Mines have provided a stimulus to mining in the district.

On the Pauper Farm manganese property, worked by White Manganese Co., 10 miles northeast of Cartersville, Ga.

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How to Operate a Grinding Circuit

ROBERT H. RAMSEY, *Associate Editor*

To help beginners in mining to get started, and old-timers to keep brushed up, E.&M.J. is publishing a series of articles based on the practical suggestions of skilled men who work with mine and mill equipment. Reprints of this article, and others on flotation, thickeners, and drifter drills, are available at fifteen cents each.

HOW HARD a ball-mill operator has to work depends partly on himself, and partly on the kind of muck the mine sends over to the mill. In some plants, the ore may change two or three times a shift, and a ball-mill operator has to keep on his toes.

That's why it would be just as well for you, as a ball-mill operator, to study out a few ways of doing your job easier and better, because there will be times, even in the best of mills, when you'll run into a lot of trouble. Collected here you will find some practical suggestions, contributed by a number of good mill men, that might give you an idea or two that would help get around some of that trouble.

To be sure we understand each other, let's begin with the equipment. In a simple grinding circuit there will be a ball mill and a classifier. Some circuits, especially in large mills, have more units or two or three stages of grinding, but whatever is said here will apply to the complicated circuits as well as the simple ones.

The two types of ball mill in general use are the grate mill and the open-end mill. Most manufacturers make both kinds; the difference between them is that the grate mill has a steel grid clear across the discharge end, but the open-end mill has only an open trunnion at the discharge end, through which pulp flows freely. If you don't already know all about the inside of your ball mill and what it is supposed to do, it would be a good idea to ask the shift boss, the metallurgist, or the superintendent to tell you about it.

Mechanical classifiers make use of rakes, spirals, or a simple drag belt. For our purposes it doesn't matter which type you are working with, because you would handle them all in pretty much the same way.

In operation, you add water to the ball mill along with the ore. Flowing out of the ball mill, the ground ore pulp pours into the classifier pool, where the finished material is separated from the coarse sand. You do that by adding a lot more water to the pool, so that the finer sand overflows the weir and goes on to the next step (flotation perhaps), and the coarse sand settles to the classifier bottom and is raked back into the mill to be ground finer. You, the operator, are supposed to control these actions in order to send on to the machines below you the right amount of ore, ground just fine enough, and with just the right amount of water with it.

To help you do this, and to make a record of how things are going, you will have to take samples of the pulp regularly. Different mills have different ideas on sampling, but all of them take at least hourly samples of the classifier overflow. What it amounts to is weighing a certain volume of the pulp to determine its density. Higher density means thicker pulp and usually coarser sand. Lower density means thinner pulp and finer sand. The shift boss will tell you what the density ought to be, and it will be up to you to hold it there.

You may also have to take density samples of the ball-mill discharge, which runs a lot thicker than the classifier overflow, and some mills also expect you to take measured samples of the ball-mill feed and weigh them.

Another sample you may take is one for pH, which is a term that takes a little explaining. You can find out exactly what pH means from a chemistry book if you want to; but for all practical purposes, it is enough to know that pH is a number that tells you how much acid or alkali there is in the pulp. A pH of 7 is

Table I. Controls for Grinding Circuit

Control	Adjustment	Effect
Feed rate	Increase from too low.	Coarser grind, more circulating load. Effect on classifier overflow depends on fineness of ore fed and amount of increase in feed rate.
	Decrease from too high	Finer grind, less circulating load. Probably more fine sand in classifier overflow.
Ball-mill feed water	Increase	Coarser grind; may wash out mill if add too much water. May increase circulating load and cause thinner classifier overflow.
	Decrease	Finer grind, but may choke mill if cut too far. May lower circulating load and cause thicker classifier overflow.
Water to classifier	Increase	Thinner and finer overflow; higher circulating load.
	Decrease	Thicker and coarser overflow; less circulating load.

In addition, a few mills use a baffle board across the classifier pool. Shifting the baffle toward the tail end throws out a coarser overflow; moving it ahead makes the overflow finer and puts more sand into the circulating load. In a few mills, the classifier overflow weir can be raised or lowered. Raising it makes the overflow finer; dropping the weir makes the overflow coarser. Variable rake speed is another control used in a few mills. Most operators think rake speed is better left alone.

exactly neutral, neither acid nor alkaline. If you add acid, the pH goes down below 7; if you add an alkali like lime, the pH will go up, say to 9 or 10, depending on how much lime you add. In any case, you can bank on it that if the brass hats want you to watch the pH at all, they have good reasons for wanting you to hold it steady.

You may also have the job of adding balls to the mill each shift. The shift boss tells you how many or what weight, and you put them in. Drop them into the scoop if you have a grate mill, or put them in through the discharge trunnion if it is an open-end mill.

The controls you will have to work with are given in Table I, and are also indicated in the drawing. As to which one of these controls is most important, mill men don't all agree. Probably it depends on what kind of ore you are grinding. Most good operators, though, say that the classifier water valve should be the first one to adjust, because it controls directly the kind of finished material you send on down the line to the next man.

The most important point is this: You cannot adjust any one of these controls without paying some attention to the other two. For example, if you change the feed rate, you will probably have to reset the two water valves. They all work together. In fact, the whole grinding circuit acts like a team of horses, and as the new driver, you may have a tough time at first.

What to Look For

In Table II you will find some suggestions on what to look for to help you decide how to use these controls. In the column headed "If you find," there are set down the things you'll run into if something is wrong with the circuit. That is, if the ball-mill feed gets finer than it usually is, the top line tells you what to expect and what to do. But don't think you have to do all these things all the time. Do only as much as you are sure you have to do.

The classifier overflow is really the most important spot in the circuit, because whatever comes over that weir is out of your hands, and your work will be judged by how good a product it is. Most operators believe that if there is any change in setting to be made, the density of the classifier overflow is where you make it first. Remember, more water to the classifier means thinner pulp and finer overflow; less water means thicker pulp and coarser overflow.

Watch the Feed

The matter of feed to the ball mill brings up a point that is important in keeping you out of trouble. You can find out by asking the old-timers how each kind of ore is going to act when it hits the mill, and if you keep your eyes open, you can get set for each change as it comes along.

For example, suppose you are working in a lead-zinc flotation mill where there are two kinds of ore—one that is coarse and low grade, and another that is finer and higher grade. Keep the feed to the ball mill lower when the coarse stuff comes along, because it takes longer to grind and you don't want to overload the mill. Then when the fine muck shows up, increase the feed and also run the classifier density higher. That will throw the high grade over into the flotation cells where it belongs.

You see, the high-grade mineral is heavier than the low grade, and it takes a little higher density in the classifier to lift it out. If you carry a low density, too much lead and zinc mineral keeps going back into the ball mill, and eventually may be gound into slime and lost altogether. Doing extra little things like this is what marks a really good operator, and you can learn these things only by study and asking questions.

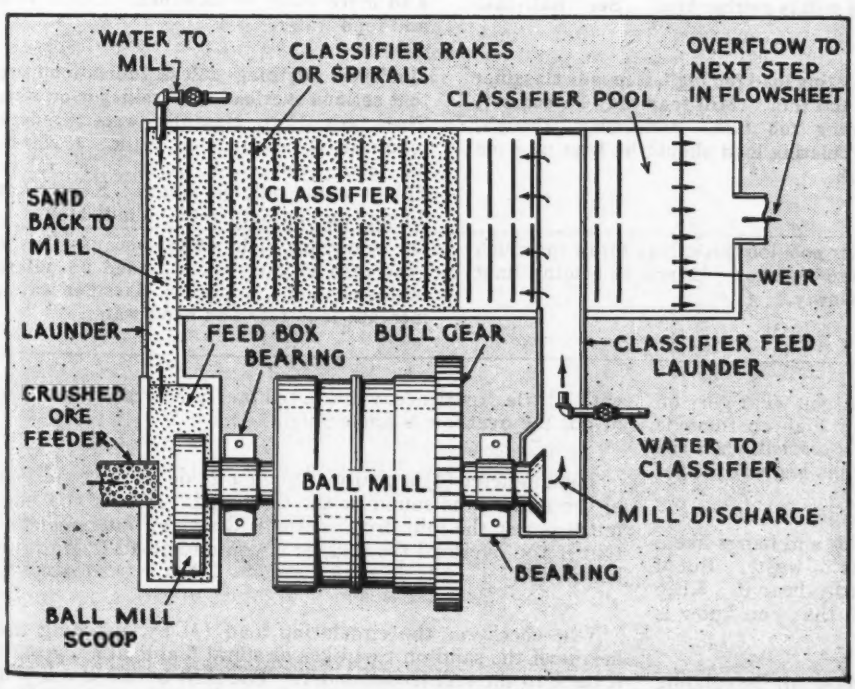
Looking for Trouble

"Keep ahead of trouble" is good advice for flotation operators, and it is just as good for ball-mill men. A good operator can take care of even big changes in muck so smoothly and easily that if you were watching him, you'd never know anything was running differently.

On the other hand, consider Joe Blow, the Wonder Boy. That's him down there sitting on the rail near the ball mill, swinging his heels and probably wondering whatever happened to that little blonde hasher over at the Greasy Spoon. Suddenly Joe looks up. He has heard a splashing sound that doesn't belong there. The ball mill is strangely quiet. Joe looks at the feed box, and finds pulp pouring out on the floor.

Joe can tell right away what has happened. The mill has been overloaded and the grate has plugged. Quick as a flash, Joe races around and shuts the feed off, then whips open the valve pouring water into the mill. He's fast; he wants action.

He gets it. The mill comes unstuck with a vengeance and belches sand into the classifier like a tidal wave. Joe, the dope, flushes water into the classifier, too, and you can almost hear it groan as the rakes get buried. The flotation man down below is tearing his hair and spinning valves. What he says about Joe blisters the paint on the concentrate launders, but Joe can't hear him. Joe is up under the mill shoveling



Here are main elements of a simple grinding circuit. Chief operating adjustments are ore feeder, water to classifier, and water to mill.

Table II. Handling the Grinding Circuit

IF YOU FIND		IT MEANS	YOU SHOULD
1. Ball-Mill Feed	Finer	Mill will grind faster, classifier overflow will thicken and get coarser.	Increase classifier water to raise circulating load; perhaps raise mill feed.
	Coarser	Mill will grind slower, classifier overflow will thin out, get finer. If fed too fast, a grate mill may plug.	Cut down classifier water, and may need to cut mill feed and water.
2. Ball-Mill Discharge	Thinner	Feed too slow or too coarse; too much water in feed. Mill will be underloaded and classifier too dilute.	Increase feed if too slow; cut feed if too coarse. Cut feed water. Check density in classifier and adjust with water.
	Thicker	Feed water too low; feed too fast or too fine. Mill may be overloaded, classifier overflow may get too coarse.	Increase feed water *carefully*. Check on feed and other water conditions, and adjust where necessary.
	Stops or slackens	Grate plugged or trunnion blocked. Pulp backs up, spills from feed box.	Shut off feed and classifier, leave head water on. Muck will start running in a minute. How did you get into this mess?
3. Sound of Mill	Loud, metallic rattle	Mill is nearly empty of muck; balls banging each other and wearing out liners.	Raise feed, cut head water if necessary. Increase classifier water to build load.
	Thick mushy sound. Quiet	Mill choked with muck, not grinding.	Cut down feed, increase head water *carefully*. Cut classifier water a little.
4. Ammeter on Ball Mill Drive	Power dropping	Trouble coming. Mill either overloaded or underloaded. Can tell by sound, feed, or appearance of discharge. Checking ammeter especially important on grate mills.	Check all other indicators and make required adjustments. Try to head off whatever is going wrong.
	Power rising	All OK, if no mechanical trouble.	Looks like you're doing all right. But don't let power go above normal without your finding out why.
5. Classifier Overflow	Density rising	Muck getting finer; perhaps too little water to feed; classifier water too low.	More water to classifier (but slowly) and to mill feed if necessary.
	Density falling	Muck coarser or coming too fast; too much water to classifier; too much water in feed.	Cut down classifier water and mill feed water. Reduce feed if necessary.
6. Classifier Overflow	Finer	Feed to mill is getting coarser. See "Ball-Mill Feed."	Cut down classifier water. Check feed and feed water.
	Coarser	Feed to mill is getting finer. See "Ball-Mill Feed."	Add more water to classifier. Check feed and feed water.
7. Circulating Load	Rising	If circulating load too high, it means classifier pool is too thin. Mill feed may be coarser, or coming too fast. Remember, though, that circulating load should be kept up good and high.	Don't do anything unless indications are that serious overload of classifier is on way. Then, cut down classifier water, reduce feed rate, or reduce head water. If classifier gets overloaded, don't raise rakes. Things would only get worse. Keep rakes digging and adjust circuit as indicated.
	Falling	Classifier pool too thick, may throw too much sand into overflow. Muck is coming finer or too slowly.	Do something right away, because it is a good idea to keep rakes loaded up unless mill is choked. Add more classifier water, increase feed rate and head water.

Watching the mill discharge (2) will tell you what goes on inside the mill. Some operators note how high on the side of the discharge flange the wave of pulp is carried when the mill is running right. Then if the wave runs higher or lower than that, they know something is wrong.

If the mill is low on muck, (3) it rattles and bangs like a boiler factory, and a lot of good steel goes to waste. But if the mill is too full of muck, you can hardly hear it. Keep your ear peeled for the sound of the mill that you know is right.

Many operators feel the classifier overflow (6) by rubbing their fingers together with their hands in the stream, and with a little experience, you can tell pretty accurately whether or not the overflow is fine enough.

The ammeter (4) is really as good a guide to the condition of the mill as the sound or the discharge. It tells you how much power the mill drive motor is drawing, but remember that if you overload the mill, or if you underload it, it draws less power.

You check on the circulating load (7) by watching the height of the sand on the rakes or spiral flights as they push it back to the mill feed launder. The shift boss will tell you about how high the sand ought to come.

like mad and hoping to get the mess cleaned up before the shifter comes.

The funny part of it is that if Joe thinks about this at all, he probably says to himself, "It's a lucky thing for the company it was me that was on shift when that happened."

What was wrong? He shouldn't have let the mill plug in the first place. But suppose it plugged anyway, he should have cut off the feed all right, but he should also have shut down the classifier, and increased the head water only a little. Then he should have cut down on the classifier water and then increased it, little by little, when the mill opened up. He should have done his best to keep things balanced instead of slamming everything out of adjustment at once. Well, he'll learn. He will, or the boss will murder him some dark night.

Using the Table

Now, just because all these things to look for and to do have been put down in a table, don't think you ought to walk your shift carrying this copy of *E.&M.J.* in one hand and a density sample can in the other. It is no use trying to run a mill out of a cook book. But what we did want to do was to set these things down here so you could think about them, and keep thinking about them, while you are working.

Just go at the problem the way things are arranged in the table. When something in the circuit begins to change, make sure you know exactly what is happening; then ask yourself what is causing it. Then, when you have answered that question, decide what to do about it. Think out each thing you do, and don't do things in a rush or without knowing why you are doing them. Don't be a Joe Blow, in other words.

One thing more, and a very important thing: When you do make a change, allow a little time, say 15 or 20 minutes, for the effect to show up before you make another change. Don't over-control. For instance, if the density in the classifier is up a little and you add more water, don't expect the density to change right away, and don't go back and open the valve even wider just because nothing seems to have happened. It will; just wait a while. A super-operator who can't let well enough alone gets on everybody's nerves.

Starting and Stopping

In starting the grinding circuit after anything but a very short shutdown, raise the classifier rakes or spirals enough to clear the sand packed on the tank bottom, start the classifier overflow pump, then start the classifier, and after that, the ball mill. But don't throw in all these switches at once. You'll get the electricians down on you if you do. Keep the water fed to the circuit down low until the load builds up a little; then set the valve hand wheels at about the point they should be for normal operation. You can check on this setting by marking one spot on the rim of the wheel and counting turns, or by counting exposed threads on the valve stem. Don't forget to lower the classifier rakes again as the load builds up.

In shutting down the mill, cut off the feed a few minutes before the shutdown is due. That will give time to grind out some of the circulating load and will make starting easier. Then when you are ready to stop, shut down the mill, then the classifier (raise the rakes), then the pump for the classifier overflow, if there is one.

If the power fails suddenly, shut off the water valves and raise the classifier rakes. And for goodness sake, don't forget to shut off any drip cans or siphon feeders of pine oil or other reagent you may have running somewhere in the circuit.

So far as mechanical trouble goes, there will probably be little of that if the equipment is reasonably good. Ball mills spring leaks from time to time because the bolts holding in the liner plates work loose. If a leak develops near the discharge end of the mill, shut down right away and fix it. This is especially true of an open-end mill. The point is that you don't want sand getting into the trunnion bearing or the gears that drive the mill. Sand can cut them out in short order.

Safety

Now a word about safety, a subject that I am putting last because I want to leave it first in your minds. Whatever else you do, don't go poking aimlessly around the mill or the classifier, sticking your nose or your fingers in here and there to see how the machinery works. I wouldn't make that statement if I hadn't seen a man or two doing just that. Nor have I forgotten the time I was routed out of bed at two a.m. to help bandage a man whose right-hand fingers had just been taken off by the ball-mill scoop as effectively, though not as neatly, as a surgeon could have done it. He had been "just poking around," too. Remember your company, and your country, need you on that ball-mill floor, and you wouldn't be happy holding down a hospital bed these days. So just be careful.

This article is based in large part on experiences and opinions generously supplied by the following mill men: Clyde Simpson, Bagdad Copper Co., Hillside, Ariz.; E. J. Duggan and M. E. Kennedy, Climax Molybdenum Co., Climax, Colo.; John Palecek, Keystone Copper Corp., Copperopolis, Calif.; Frank M. McKinley, Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho; Malcolm Black, Wright-Hargreaves Mines, Ltd., Kirkland Lake, Ont.; and the concentrator staffs at Hudson Bay Mining & Smelting Co., Flin Flon, Manitoba, and Sherritt Gordon Mines, Ltd., Sherridon, Manitoba.

Flotation Operator:—"Slow down, Superman, you're four laps ahead of the mill already."

Some Safety Suggestions For Mine Arc Welders

WELDING HAZARDS

1. Fire. Inspection of equipment, particularly connections, cables, and return circuits, will eliminate arcs or flashes in unexpected places which might cause fires.

2. Presence of Fumes or Smoke. Adequate ventilation to dilute and remove fumes will eliminate this hazard.

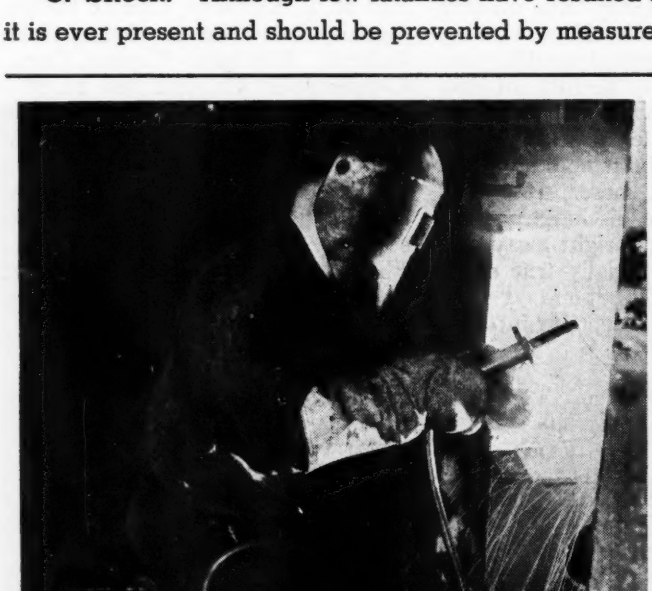
3. Ultra-violet and Infra-red Rays. Commonly used helmets and protective clothing prevent all harmful effects of these radiations.

4. Mystery Rays. Mystery rays do not exist, although occasional rumors state that arc-welding equipment gives off radiations which will produce sterility or other ailments. Photographic film placed in the clothing of welders showed no evidence of radiation even after weeks of exposure.

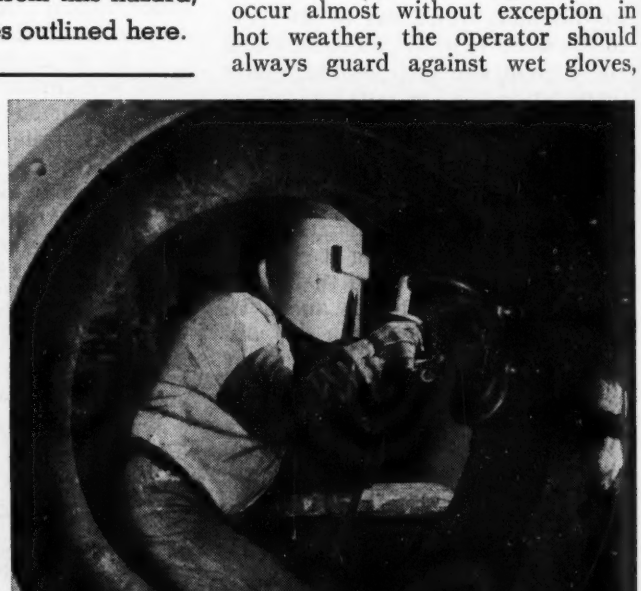
5. Shock. Although few fatalities have resulted from this hazard, it is ever present and should be prevented by measures outlined here.

COMMON DANGEROUS PRACTICES contributing to arc-welding accidents have been carefully analyzed by R. F. Wyer, application engineer, Electric Welding Division, General Electric Co., and are here illustrated for the benefit of many welders employed in smelters, mills, mine surface plants, and underground. Fortunately, accidents in the nation due to arc welding have been few. Records indicate that only four electrocutions occurred in 1943, during which year it is conservatively estimated that more than 200,000 were employed as operators of arc-welding equipment. Nevertheless, seemingly trivial practices which can prove fatal should be discouraged.

In a general way, operators of welding equipment should develop a healthy respect for all electrical circuits. As fatal welding accidents occur almost without exception in hot weather, the operator should always guard against wet gloves,



This operator is using an uninsulated holder which if contacted with wet clothing or gloves could send hundreds of volts through his body and cause electrocution. In one case 76 volts caused a fatality. The cables coiled carelessly underfoot may trip him when he rises and cause injury due to fall or shock.



This is an ideal set-up for trouble. The operator is in a cramped space, and unless his clothing is dry and his shoes are free from nails, his body is in contact with the conducting metal in a number of places. Further contact with the uninsulated head projecting beyond the ring or collar just above his hand could cause a shock which if accompanied by involuntary or spasmodic motion, might injure the operator.

An arc-welding operator should never sling an electrode holder over his shoulder, nor leave an electrode in a holder as shown.

The insulation on this electrode holder is broken. In cases where electrocution of a welding operator has occurred, one or more of three factors were usually involved: (1) An uninsulated electrode holder. (2) Wet gloves and clothing. (3) A fall.

shoes, and clothing, particularly clothing made of thin cotton fabrics. Other precautions to be observed by the operator are as follows:

He should see that the insulation of the electrode holder is in good condition.

He should learn to carry an electrode holder by the handle, never slung over his shoulder, or squeezed under his arm.

He should never under any circumstances transport an electrode holder with an electrode or an electrode stub in it.

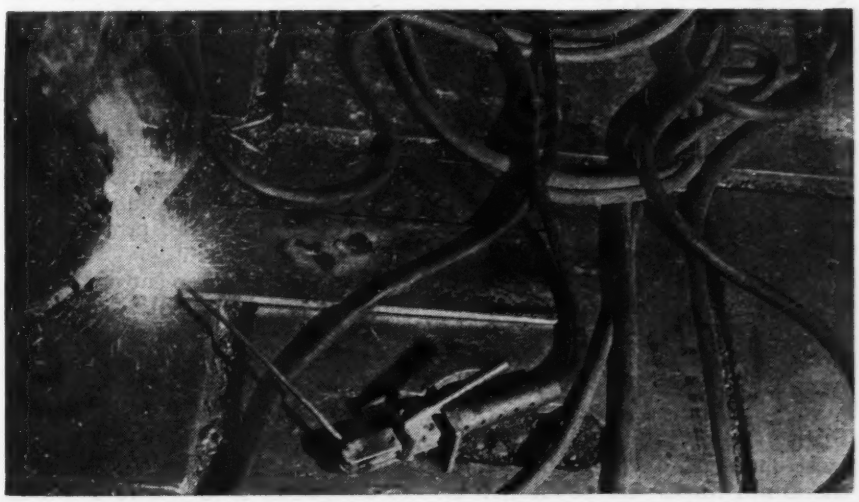
He should never throw or lay an electrode holder down so that it makes contact with any conducting material.

He should never work alone in confined or concealed spaces where, for example, striking his head may cause temporary loss of his faculties.

He should be particularly careful when working above the ground floor, since it is significant that many fatalities involve a fall.

Keep Equipment Safe

With respect to the installation of arc-welding equipment, it is imperative that the frame of the welding set be properly grounded, whether it is an a-c or d-c unit, or whether it is portable or stationary. An ungrounded unit, even one in perfect condition, can give annoying shocks and tickles to grounded individuals, because of the inherent ability of an electrical circuit to induce a static charge on another conductor separated from it by insulation. The effect is the same as that in a condenser or Leyden jar.



An electrode holder should never be thrown or placed where it can make contact with conducting material.

Adequate over-current protection should be installed in the power circuit to the welder. Fuses or circuit breakers must be capable of interrupting the maximum current which may be drawn by a short circuit in the motor or power leads of a d-c welder, or in the primary circuit of an a-c welder. Disconnecting switches must be capable of interrupting the stalled rotor current of the d-c machine, or the maximum current which can be drawn by the a-c unit when the welding electrode is short circuited on the work.

On the welding-circuit side of a unit, care should be taken to avoid the possibility of getting double the normal circuit voltage between two adjacent welding circuits, because of the connection of one unit with one polarity, and the other with opposite polarity.

Probably the most important item in equipment, from the safety point of view, is the electrode holder. Although un-insulated holders have been used in arc welding for many years, good practice requires the use of fully insulated holders.

Fire hazards should obviously be watched for and, when found, eliminated. Welding cables and their connectors should be examined frequently for breaks in insulation. The extremely hard service to which welding cables are subjected often results in severe damage to the insulation. Likewise, welding return-circuit connections should be given attention. Arcs in unexpected places along the return path of the welding current may result in fire hazards if reinforcing rods or scrap lengths of pipe or bar laid together are used indiscriminately.

Wartime Mineral Output in Canada Reaches New High

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IN VOLUME OF MINERALS and other war supplies, Canada has advanced from eighth to second place among the United Nations in foreign trade. In population, the Dominion stands thirty-first. Credit and exchange have maintained a sound position in world markets. Distinguished in the first World War as "mankind's vast granary," Canada has become the fourth greatest industrial nation in the world. Its industry, capitalized before 1939 at less than $3,000,000,000, has now been expanded to a capacity of about $4,333,000,000. The growing status of the country has been reflected through the important part taken in the work of international agencies set up to deal with war problems as well as with those of the postwar period. In this the expansion of the minerals industry is regarded as a critical factor.

Canada's position in relation to world mineral markets is governed by close proximity to the United States and by membership in the British Commonwealth. With almost one-tenth of her manpower in the armed forces, her population of less than 12 million imports from the United States a volume of finished goods and raw materials almost equal to the total United States export trade with the 130 million people of Latin America.

Demand for war materials since 1939 has led to expanded output of Canadian non-ferrous metals. This has provided about 94 percent of the nickel consumed by the Allies (the 1944 output was more than 50 percent above any prewar year), 32 percent of the aluminum, 20 percent of the mercury and zinc, 17 percent of the lead, 10 percent of the copper, and 75 percent of the asbestos. The essential place held by mining in domestic economy during the war years has indicated the potential importance of the industry in preparing an effective postwar program for the country as a whole. Important new resources and industrial activity have been established as a result of the program centered on war requirements. Magnesium, optical glass, and chemicals provide outstanding examples.

With about 90 percent of the Dominion's non-ferrous metals shipped out of the country, armament exported in 1943 was valued at more than $1,500,000,000, which was almost double the value of all exports in 1939 and equal to the value of all minerals allocated for war purposes to the end of 1943. A record total of approximately $3,500,000,000 was attained by export trade in 1944, of which 80 percent was war business. This was about four times the 1939 volume.

The exportable surplus of minerals has been reserved largely for armament in Britain and the United States, as part of a broad expansion program in the recovery of nickel, copper, lead, and zinc exceeding all previous mining activity. Various other strategic and critical minerals that were not formerly exploited have been brought into production. Among those showing major increases in 1943 were the following: chromium, cobalt, magnesium (7,150,000 lb., compared with 809,000 in 1942), mercury, molybdenite concentrate, titanium ore, and tungsten concentrate. The value of exported minerals, metals, and metal products was $1,083,000,000 in the first ten months of 1944, compared with $882,000,000 in the same period in 1943 and $275,300,000 in all 1939.

Contracts have been in effect with the British Ministry of Supply, under which non-ferrous metals have, since 1939, been sold at levels below world open-market prices. This control basis has been recognized as an outstanding Canadian contribution to the war effort. The Advisory Committee on Reconstruction reported in September 1943 to the Dominion Government:

"The demands of war have imposed a heavy burden on the base metal mines of Canada. They are operating under conditions where the need for maximum output has led, in many cases, to mining practices which would normally be considered to be contrary to the soundest engi-

Table I—Cumulative Dividend Record of Canadian Metal Mines (a)

Province and District	1941	1942	1943	1944	Total to End of 1944
ONTARIO:					
Sudbury (b)	$31,757,739	$31,590,863	$31,590,863	$25,768,965	$446,001,187
Porcupine	16,502,243	12,274,518	11,547,594	10,132,414	238,359,196
Kirkland Lake (d)	14,144,989	9,385,023	8,296,048	6,983,162	205,988,611
Cobalt (e)	180,000	120,000	120,000	60,000	108,002,442
Patricia	4,785,974	3,759,028	2,225,838	1,746,695	29,517,495
Matachewan (e)	63,364	63,364	63,364	23,762	345,818
Michipicoten (f)	64,200	.....	.....	.....	64,200
QUEBEC	$16,017,471	$14,481,521	$17,731,296	$16,151,344	$147,146,730
BRITISH COLUMBIA (b)	16,108,786	14,232,034	12,631,352	7,000,909	269,746,279
MANITOBA	6,663,132	6,581,992	6,347,015	6,288,271	55,043,122
YUKON (h)	547,694	.....	.....	341,916	1,312,207
N.W.T.—Yellowknife (i)	149,775	99,850	99,850	99,850	449,325
NOVA SCOTIA (g)	.....	.....	.....	.....	77,424
MISCELLANEOUS (j)	1,576,218	2,373,505	2,503,577	2,359,453	16,976,502
Totals	$108,561,585	$95,321,698	$93,156,797	$76,956,741	$1,519,030,538

(a) Revised to Dec. 21, 1944, based on data from *The Northern Miner*. (b) Payments in U.S. funds made by International Nickel, Howe Sound, Granby Cons. (c) Since 1933, represents payments by Nipissing Mines, a holding company. (d) Includes two Larder Lake producers. (e) Young-Davidson Mines. (f) Cline Lake Gold Mines. (g) Dividend record incomplete. (h) Yukon Cons. (i) Negus Mines. (j) Includes nine holding companies and, in 1944, capital distribution of $956,754 from three dismantled gold mines.

neering tradition. . . . Your Committee recommends that study be given to the taxation regulations at present in effect, with a view to maximizing the ore production of our mines."

Further study was given this problem at Vancouver in November 1944 by Ministers of Mines representing the six major mining Provinces.

The termination, Jan. 31, 1945, of British purchasing contracts for Canadian copper will divert this product, at least temporarily, to the United States, where the Foreign Economic Administration had contracted for all unsold Canadian copper to March 31, 1945. Distribution of Canadian metals for export may be decided in the near future by two organizations representing Canada, Britain, and the United States: the Combined Resources Production Board, and the Combined Raw Materials Board.

Ranking first in production of nickel, platinum, radium, and asbestos, Canada is the world's second largest producer of aluminum and holds third place in the mining of copper, lead, and zinc. Facilities have been installed for recovery of iron ore on an important scale. Domestic armament plants have fabricated about one-third of the metallic ores, which, as recently as 1940, had

Table II—Canadian Metal Mines Producing in 1944

Mining Company	Recovery per Ton 1944	Working Cost per Ton 1943	Daily Mill Tonnage 1944	Daily Mill Capacity 1944	Date of First Production
ONTARIO					
Algoma Ore Properties (siderite)	.....	.....	1,985	2,200	July 1939
Aunor Gold Mines (*h*)	14.78	5.88	345	475	Jan. 1940
Berens River Mines (*ii, u*)	17.28 (*a*)	11.38	152	250	Sept. 1939
Bidgood Kirkland Gold Mines	7.36	8.33	135	150	July 1934
Bonetal Gold Mines (*b*)	5.67	5.52	89	.....	Nov. 1941
Broulan Porcupine Mines	9.48	4.40	315	550	Nov. 1939
Buffalo Ankerite Gold Mines	6.86	5.84	654	1,230	June 1926
Central Patricia Gold Mines	11.38	6.69	275	400	May 1934
Chesterville Larder Lake G.	4.70	3.89	500	700	June 1939
Cochenour Willans Gold Mines	18.09	9.65	135	170	Dec. 1939
Coniaurium Mines (*g*)	9.77	7.20	290	600	May 1928
Delnite Mines (sylvanite)	6.68	4.64	305	525	June 1937
Dome Mines	10.05	4.09	1,440	1,750	1910
Dominion Magnesium, Ltd.	.....	.....	15	15	July 1942
Hallnor Mines (*k*)	12.63	5.45	300	400	June 1938
Hard Rock Gold Mines (*kkk*)	7.43	5.92	250	430	Jan. 1938
Hasaga Gold Mines	5.15	3.29	360	500	Sept. 1936
Hollinger Cons. Gold Mines (*q*)	8.88	6.07	2,500	5,000	1910
Falconbridge Nickel Mines (*g, i*)	10.28	6.92	2,310	2,325	Feb. 1930
International Nickel Co. (*j*)	14.09	8.51	34,585	35,000	1916
Kam Kotia Porcupine Mines (*e, k, kkk*)	.....	.....	410	500	Sept. 1943
Kerr-Addison Gold Mines	6.20	2.43	1,150	2,100	May 1938
Kirkland Lake Gold Mining Co.	13.14	9.67	215	450	1919
Lake Geneva Mining Co. (*l, t, iii*)	3.35	2.50	80	100	1937
Lake Shore Mines	16.75	8.61	730	2,500	1918
Leitch Gold Mines (*q*)	27.89	14.96	75	85	Jan. 1937
Little Long Lac Gold Mines (*q*)	12.93	9.01	200	350	Nov. 1934
Macassa Mines	16.84	7.29	235	425	Oct. 1933
MacLeod-Cockshutt Gold M. (*kkk*)	12.76	5.29	350	1,000	Apr. 1938
Madsen Red Lake Gold Mines	11.08	4.26	395	400	Aug. 1938
Matachewan Cons. Mines (*q*)	2.91	2.38	560	1,000	Nov. 1934
McIntyre Porcupine Mines	11.50	5.86	1,630	2,450	1912
McKenzie Red Lake Gold M. (*q*)	9.46	6.40	220	240	Mar. 1935
McMarmac Red Lake Gold Mines	8.75	7.90 (*c*)	95	100	Oct. 1940
Nickel Offsets, Ltd. (*dd*)	40.00	30.00	70	.....	Sept. 1943
Omega Gold Mines	5.41	5.23	312	525	Feb. 1936
Pamour Porcupine Mines (*h*)	3.50	2.22	1,290	1,625	May 1936
Paymaster Cons. Mines	8.46	6.44	360	600	Oct. 1934
Pickle Crow Gold Mines	18.72	8.75	203	400	Apr. 1935
Preston East Dome Mines	8.59	5.74	735	1,100	Mar. 1939
Ross Mine (Hollinger)	7.37	4.49	200	300	Jan. 1936
Silanco Min. & Smelt. Corp. (*mm*)	.....	.....	.....	100	1943
Sylvanite Gold Mines	13.54	6.73	410	600	July 1927
Teck-Hughes Gold Mines	10.32	6.29	375	1,300	1917
Steep Rock Iron Mines	.....	.....	.....	.....	Oct. 1944
Toburn Gold Mines (*f*)	12.72	11.11	112	165	1913
Upper Canada Mines	15.34	8.77	210	400	Oct. 1938
Windsor Cobalt Silvers, Ltd. (*mm*)	.....	.....	25	25	1944
Wright-Hargreaves Mines	18.92	7.87	555	1,250	1921
Young-Davidson Mines (*e*)	3.67	2.59	630	1,050	Sept. 1934
QUEBEC					
Aldermac Copper Corp. (*u, rr*)	.....	.....	175	250	June 1944
Amulet Dufault Mines (*m, s*)	8.44	0.10 (*s*)	1,000	.....	1940
Beattie Gold Mines (*g, r, kk*)	3.51	2.51	575	1,800	May 1933
Belleterre Que. Mines (McIntyre)	14.53	8.81	320	350	Oct. 1936
Canadian Malartic Gold M. (*g*)	3.63	2.83	985	1,000	May 1935
Chromite Ltd.	12.56	8.22	150	150	Feb. 1942
East Malartic Mines	4.92	4.78	825	1,800	Nov. 1938
Francoeur Gold Mines	6.63	4.77	175	400	Aug. 1938
Golden Manitou Mines (*s, t*)	6.36	3.97	870	1,000	Aug. 1942
Indian Molybdenum Ltd. (*o*)	.....	.....	700	700	Sept. 1943
Lamaque Gold Mines (*p*)	10.34	6.57	920	1,260	Apr. 1935
Malartic Gold Fields	6.27	5.40	615	1,000	Dec. 1939
McWatters Gold Mines (*z*)	5.92	5.66	110	150	1932
Mic-Mac Mines (*d, aa*)	5.65	3.93	400	600	June 1942
Molybdenite Corp. of Can. (*bb*)	.....	.....	.....	260	Nov. 1942
New Calumet Mines (*g, u*)	9.46	6.12	425	600	Oct. 1943
Noranda Mines (*ee, ff*)	10.44	5.70	5,165	7,000	Dec. 1927
Normetal Mining Corp. (*hh, jj*)	8.88	6.11	585	775	Sept. 1937
O'Brien Gold Mines (*kk*)	17.98	9.70	155	200	Sept. 1934
Perron Gold Mines (*q*)	9.53	5.52	300	400	Apr. 1934
Powell Rouyn Gold Mines (*ll*)	4.23	2.87	595	.....	Aug. 1937
Senator-Rouyn Ltd.	5.51	4.96	275	300	Oct. 1940
Sigma Mines (Quebec) (Dome)	7.22	3.93	850	1,100	Mar. 1937
Siscoe Gold Mines	5.01	3.14	1,030 (*nn*)	900	Jan. 1929
Siscoe Metals (Tetreault) (*t, oo*)	.....	.....	.....	400	Aug. 1942
Sladen Malartic Mines	3.82	3.22	590	700	Jan. 1938
Stadacona Rouyn Mines (*pp*)	6.37	4.96	390	475	Nov. 1936
Sullivan Cons. Mines	8.75	5.80	330	500	May 1934
Waite Amulet Mines (*h, s, qq*)	8.16	5.46 (*a*)	1,500	1,900	June 1937
West Malartic Mines	5.50	4.46	260	350	May 1942
BRITISH COLUMBIA					
Base Metals Mining Corp. (*hh, gg, t*)	7.11 (*a*)	5.21	130	300	Jan. 1940
Bralorne Mines (*xx*)	23.82	7.30	290	550	Feb. 1932
Britannia Min. & Smelt. Co. (*aa, yy*)	.....	.....	3,000	6,000	1903
Cariboo Gold Quarts Min. Co.	15.90	16.44	90	360	Jan. 1933
Cons. Min. & Smelt. Co. of Canada					
(Kimberley) (*t, aaa*)	.....	.....	7,145	7,500	1906
(Tadanac) (*zz, aa*)	.....	.....	(*x*)	2,400	1906
Florence Mining Co. (*t, bb*)	.....	.....	(*x*)	100	July 1943
Granby Cons. Min. Smelt. & Power Co.					
(Copper Mt.) (*aa, bbb*)	.....	.....	(*x*)	5,000	June 1937
Hedley Mascot Gold Mines (*aa, kk*)	10.75	9.26	175	200	May 1936
Highland Bell Ltd. (*ccc, ddd, eee*)	.....	.....	(*x*)	75	1936
Island Mountain Mines Co. (*ii*)	17.20	11.81	58	150	Nov. 1934
Kelowna Exploration Co.	10.69	(*x*)	240	275	1934
Pinchi Lake Mercury Mine (*n*)	.....	.....	320	800	June 1940
Pioneer Gold Mines of B.C.	16.43	13.82	60	400	1928
Retallack Mines (*ddd, jjj, u*)	.....	.....	.....	300	1944
Sheep Creek Gold Mines (Queen)	15.33	7.17	70	175	May 1935
Silbak-Premier Mines (*f*)	8.90	7.76	200	600	May 1937
Takla Mercury Mine (*ggg*)	.....	.....	(*x*)	.....	Nov. 1943
Tungsten Queen Mine (*n*)	.....	.....	(*x*)	.....	1941
Twin "J" Mines (*s, fff*)	.....	.....	(*x*)	150	July 1943
Western Exploration Co. (*t*)	.....	.....	150	225	May 1942
Zincton Mines (*a, t*)	4.93	3.31	265	275	May 1941
MANITOBA					
Emergency Metals (*s, ss, tt*)	.....	.....	210	210	May 1943
Hudson Bay Min. & Smelt. Co. (*s, uu*)	.....	5.08	6,450	6,500	Sept. 1930
San Antonio Gold Mines	11.09	4.98	345	550	May 1932
Sherritt Gordon Mines (*g, s, vv*)	.....	2.33	2,200	3,000	Aug. 1937
NOVA SCOTIA					
Caribou & Ross Mines (*n*)	.....	.....	.....	35	1937
Queens Mines	.....	.....	.....	35	1934
NORTHWEST TERRITORIES					
Eldorado Min. & Refining (*ww*)	.....	.....	.....	100	1933
Negus Mines (*hhh*)	37.31	20.68	65	75	Feb. 1939

(*a*) Recovery and costs for 1943. (*b*) Ore treated in Broulan mill. (*c*) Working cost for 1942. (*d*) Controlled by U.S. Smelting, Refining & Mining Co. (*e*) Controlled by Hollinger Cons. Gold Mines. (*f*) Controlled by Premier Gold Mining Co., one of the 10 principal foreign development companies of American Smelting & Refining Co. (*g*) Controlled by Ventures, Ltd. (*h*) Controlled by Noranda Mines. (*i*) Production in 1943 valued at $8,285,076; net profit $673,998; ore grade: 1.62% Ni; 0.86% Cu. (*j*) Production in 1943 (net sales) $170,531,497; net profit $31,127,204; copper-nickel ore contains important amounts of 11 metals, including platinum, gold, selenium, tellurium. (*k*) Ore reserves 1941: 2,000,000 tons 1% Cu; 1.4% Zn; 750,000 tons 1.6% Cu; 0.5% Zn; operations terminated Dec. 1944. (*l*) Controlled by Towagmac Exploration Co. (*m*) Controlled by Waite Amulet Mines. (*n*) Controlled by Cons. Mining & Smelting Co. of Canada. (*o*) Controlled by Dome Mines; sales contract canceled and production terminated May 1944. (*p*) Controlled by Teck-Hughes Gold Mines. (*q*) Tungsten producer. (*r*) Production temporarily suspended Oct. 1944; to be resumed Mar. 1945. (*s*) Copper-zinc-gold-silver producer. (*t*) Lead-zinc-silver producer. (*u*) Lead-zinc-gold-silver producer. (*v*) Administrative and general expense. (*w*) Shut down 6 months in 1943; resumed production Dec. 1943. (*x*) Production not reported. (*y*) Ore reserves to be exhausted Jan. 1945. (*z*) Ore exhausted and mine shut down June 1944. (*aa*) Copper-gold-silver producer. (*bb*) Operated by Wartime Metals Corp. (*cc*) Formerly owned by Molybdenite Reduction Co. (*dd*) Shipping ore to Copper Cliff smelter. (*ee*) Copper-gold producer. (*ff*) Production in 1943: 66,164,000 lb. Cu; 269,732 oz. Au. (*gg*) Production resumed July 1944 after power house destroyed by fire in Jan.; ore reserves to be exhausted in 1945. (*hh*) Controlled by Mining Corp. of Canada. (*ii*) Controlled by Newmont Mining Co. (*jj*) Copper-zinc producer. (*kk*) Gold-arsenic producer. (*ll*) Since April 1942 shipping ore to Noranda. (*mm*) Cobalt-silver producer. (*nn*) Tons hoisted, before sorting. (*oo*) Metals Reserve Co. contract canceled; property shut down May 1944. (*pp*) Since Dec. 1939, operating in bankruptcy under custodian. (*qq*) Average mill feed 1943: 4.15% Cu; 7.58% Zn; 0.036 oz. Au per ton; 1.71 oz. Ag per ton. (*rr*) Average ore reserves 1944: 6.27% Zn; 2.25% Pb; 1.52% Cu; 0.104 oz. Au per ton; 1.52 oz. Ag per ton. (*ss*) Wholly-owned subsidiary of Hudson Bay Mining & Smelting, operating old Mandy mine. (*tt*) Average ore reserves 1943: 5.47% Cu; 16.5% Zn; 0.095 oz. Au per ton; 1.9 oz. Ag per ton. (*uu*) Average ore reserves 1943: 2.59% Cu; 4.16% Zn; 0.085 oz. Au per ton; 1.25 oz. Ag per ton. (*vv*) Average for West orebody reserves 1943: 2.45% Cu; 1.99% Zn; 0.017 oz. Au per ton; 0.57 oz. Ag per ton. (*ww*) Jan. 1944, mine and other assets taken over by government for radium production. (*xx*) Also treating ore from Bradian mine. (*yy*) Controlled by Howe Sound Co. (*zz*) At Trail are located customs concentrator, zinc production plant and refinery, copper smelter and refinery, fertilizer plant, etc. (*aaa*) Sullivan mine, near Kimberley, is world's largest lead-zinc-silver producer; tin is recovered from flotation tailings at Kimberley. (*bbb*) Average ore reserves 1943: 1.2% Cu, 17,341,453 tons. (*ccc*) Merger of Highland Lass and Bell Mine. (*ddd*) Silver-lead-gold producer. (*eee*) Ships ore to Trail smelter. (*fff*) Mill closed May 1944. (*ggg*) Controlled by Bralorne Mines; production suspended Sept. 1944. (*hhh*) Mill closed Oct. 1944. (*iii*) Shut down Sept. 1944. (*jjj*) Controlled by Kootenay Belle Gold Mines. (*kkk*) Shut down Dec. 1944.

Table III—Output of Canadian Mineral Industries (a)

	Metallics	Non-metallics	Gas, Oil Coal & Peat	Structural Materials & Clay Products	Total Value
1919	$ 73,262,793	$76,002,087 (b)		$27,421,510	$176,686,390
1929	154,454,056	$21,073,959	$76,787,397	58,534,834	310,850,246
1939	343,506,123	25,061,849	70,671,328	35,362,759	474,602,059
1940	382,503,012	26,011,498	78,837,874	42,472,651	529,825,035
1941	395,346,581	34,379,440	85,141,997	45,373,272	560,241,290
1942	392,192,452	36,677,122	92,169,291	45,729,807	566,768,672
1943	356,812,760	36,864,369	92,259,333	42,010,000	527,946,462
1944 (c)	307,336,217	34,201,001	99,375,245	41,348,000	482,260,463

(a) Data issued by Mining, Metallurgical, and Chemical Branch, Dominion Bureau of Statistics. (b) Combined value of non-metallics and fuels for 1919. (c) Official Ottawa estimate Jan. 1, 1944.

been exported only in crude, smelted, and refined forms. In the last four years, Canadian plants have taken delivery of about 65 percent of domestic copper output, 35 percent of the zinc, and 25 percent of the lead for use in manufacturing finished products, less than one-third of which have been for domestic consumption. From 1939 to 1943, there was an increase from $74,000,000,000 to $764,000,000,000 in the value of fully or chiefly manufactured material for export, representing metal and non-metallic mineral products.

An estimate in November 1944 showed that more than 40 gold properties, located in widely distributed areas across the Dominion, had obtained results from holes put down by some 300 diamond drill machines to warrant underground work as soon as Ottawa restrictions have been removed. A marked increase in prospecting activity in the past two years led to the staking in 1944 of a record-breaking number of mining claims. Promising gold discoveries have been reported in the region made newly accessible by the Alaska Highway and, in the Northwest Territories, a major orebody has been indicated by extensive diamond drilling on the Giant Yellowknife property. Rich strikes have also been reported on the Transcontinental property and in the vicinity of Gordon Lake.

Commercial possibilities for precious metals have been reported in various camps across Canada, including the Snow Lake area of Manitoba; the Midlothian and Red Lake areas of Ontario; the two extensive belts running east from the Porcupine and Kirkland Lake camps through Duparquet and Rouyn; and the Mud Lake area, in Quebec.

Production of iron sinter was continued in 1944 at the New Helen mine, Michipicoten district, Ontario, where the Josephine, Ruth, and Lucy properties of Michipicoten Iron Mines (controlled by Sherritt Gordon) were being prepared to ship both sulphide ore for sintering, and high-grade hematite. In New Brunswick, where iron ore had not been recovered since 1915, Dominion Coal & Iron Corporation opened a property in 1943 and in the first year shipped 127,734 tons of crushed and screened hematite and magnetite.

Large-scale operations of Steep Rock Iron Mines, at Atikokan, Ont., suffered a setback in attaining the goal announced for the initial shipping season of 100,000 to 500,000 tons. As a result of operating hazards at the "B" orebody, following the removal of water from the lake, it was found necessary to limit delivery of ore to less than 16,500 tons.

Pre-Cambrian Promises

Of major significance in the post-war expansion of mining in Canada is the area of some 500,000 square miles of Pre-Cambrian rocks within the boundaries of the Province of Quebec, and extending eastward into Labrador. Air transportation is expected to offer facilities that will stimulate the search for ore deposits throughout that great expanse of country lying east of Hudson Bay and north of the Transcontinental Railway. Largely due to remoteness, discoveries made years ago in the Chibougamau and other areas are not yet productive.

Active mining areas in Quebec include the Eastern Townships, near the Vermont boundary, where copper has been produced almost without a break since 1865; Thetford, where asbestos has been mined since 1878; and substantial amounts of chrome ore have been recovered in the Eastern Townships under stress of war needs. In northwestern Quebec, copper-gold production from the Noranda mine was first secured in 1927 and, from that year to the end of 1942, this area recovered some ten minerals having a combined value of $446,923,278. Five mines of the newly opened district in 1943 contributed 116,382,081 lb. of zinc to the war effort, compared with the 1939 output, largely from two mines, of 28,758,759 lb.

Quebec mineral output in the first ten months of 1944 included 628,937 oz. gold (788,378 oz. in the same period of 1943); 2,033,211 oz. silver (1,796,190); 348,845 tons asbestos (388,834); clay products, $1,566,893 ($1,374,888); lime, 287,606 tons (317,146); and cement, 2,877,745 bbl. (3,088,281). In the first nine months of 1944 copper output was 83,407,987 lb. (103,580,516) and zinc amounted to 101,413,566 lb. (110,064,655). Total output for 1944 was valued at $87,416,810, compared with $101,610,678 in 1943.

Ontario, with 39 gold mines continuing in production in October 1944, reported gold output in the first ten months of the year at $54,288,270. Gold recovery in October was the lowest recorded for any month since December 1933. Nickel output of 104,370 tons was reported for the first nine months of 1944, compared with 143,983 tons in all of 1943. The total value of Ontario's mineral production in 1944 was estimated at $209,349,689, compared with $231,603,170 in 1943.

Saskatchewan expanded its mineral production from $2,411,049, with metals accounting for only $527,699 in 1933, to $25,091,849 for the fiscal year ended April 30, 1944. The latter figure includes metals, valued at $20,940,433; sodium sulphate, $665,195; clay products, $347,982; sand and gravel, $698,338; and fuels, $2,439,901. Manitoba increased the value of 1943 output ($13,412,266) to $13,728,126 in 1944.

In the Northwest Territories, gold output from the Yellowknife camp had amounted to about $20,000,000 in the five-year period ended October 1944, when the last operating property closed as a result of labor shortage. The recovery of radium from pitchblende at Great Bear Lake is being continued at full capacity, under government control. Total production in all of 1944, not including pitchblende products, was valued at $2,112,285, compared with $2,679,993 in 1943. Yukon Territory produced an estimated $954,850 in gold in 1944, compared with $1,625,819 in 1943.

British Columbia recorded a total value estimated at $56,355,308 for minerals produced in 1944, compared with $68,442,386 in 1943. Consolidated Mining & Smelting Co. of Canada, the world's major producer of lead and zinc and the second largest silver producer in Canada, in 1944 recovered lead valued at $10,760,000 and zinc valued at $10,720,000, substantially lower than the record figures for 1942 and 1943. This operator follows International

(*Continued on page 172*)

War Development Proves Large Vanadium Reserves

A. C. JOHNSON, *Assistant Chief, and* **C. W. DAVIS,** *Chief, Iron-Steel and Ferroalloys Division, Bureau of Mines, Washington, D.C.*

ALTHOUGH VANADIUM is widely distributed in rocks of the earth's crust, deposits containing this element in sufficient concentration to have commercial value are not common.

Vanadium is generally extracted from ores and concentrates, the first stage of recovery being completed in the production of vanadium pentoxide (85 to 90 percent pure). This product is consumed largely as a raw material in making ferrovanadium, over 95 percent of the vanadium consumed being in this form. The former practice of "slime concentration" has virtually been discontinued, as it was wasteful.

Vanadium is used with other metals, particularly chromium and manganese, for making special alloy steels and is a constituent of the best grades of high-speed steels. It exerts a degasifying and deoxidizing action which aids in forming sound steel, promotes minimum of grain enlargement, and causes a stable solution of carbides to form in the iron matrix. These structural characteristics permit flexibility in heat-treatment, make possible the effective hardening and annealing of widely varying sections, and are conducive to shallow hardening. Vanadium increases the ultimate strength, elastic ratio, and resistance to shock impact and contributes to hot hardness. It acts to intensify the individual properties of other major elements in steels and improves resistance to alternating stress. Vanadium steels are used as castings, forgings, and rolled shapes; in welded assemblies, springs, airplane-propeller hubs and blades, gears, axles, high-speed tools, and armor plate; and in structural shapes.

There is no satisfactory replacement for vanadium; however, titanium and molybdenum have been used as substitutes in steels that have limited uses. Each gives to steel some of the properties produced by vanadium.

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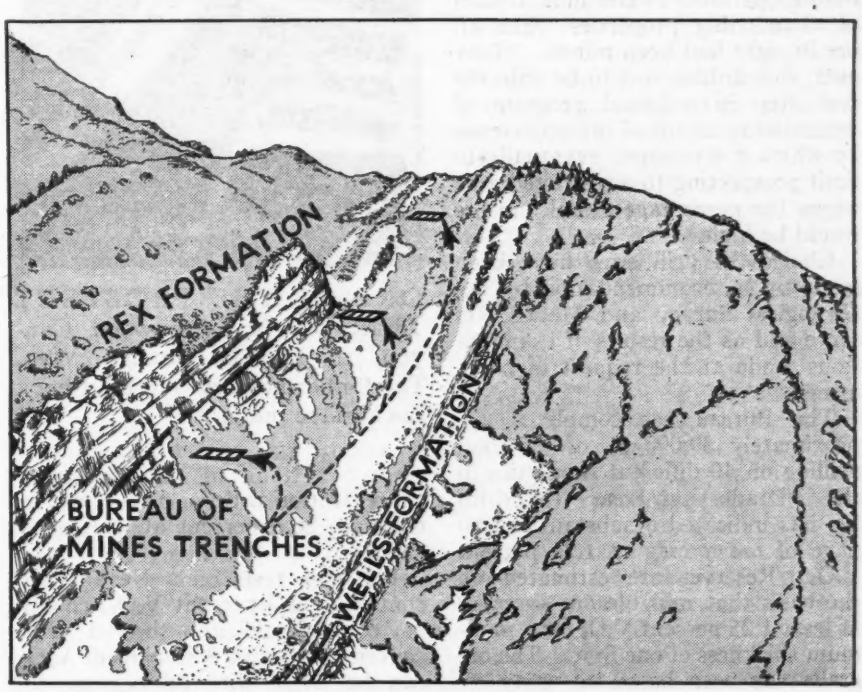


TRENCHES have been cut by the Bureau of Mines in the Phosphoria formation, north of Dry Creek Canyon, in Lincoln County, Wyo. This formation contains a large amount of vanadium-bearing shale.

Explorations have shown an unexpectedly wide distribution of low-grade, vanadium-bearing deposits with mineral associations that differ greatly. A small percentage of vanadium occurs in certain asphalts and petroleum deposits, in titaniferous magnetites in New York, in graphite-mica ores in Alabama, in a large occurrence of phosphate shale extending into Wyoming, Utah, and Idaho, in vanadinite deposits in Nevada, in complex gold-silver-lead-molybdenum-vanadium ores in Arizona, and in the sandstone areas of Colorado, Utah, and Arizona.

Colorado-Utah Deposits

The Colorado-Utah vanadium minerals are mostly carnotite and a vanadiferous mica occurring in sandstone or other sedimentary rocks over a wide area. More than 90 percent of the vanadium produced domestically comes from ores mined in this area.

With completion of the Monticello and the Durango treatment plants in September 1942, greater ore production was needed to meet the requirements of increased mill capacity. The Metals Reserve Co., in the summer of 1942, instituted an ore-purchasing and stockpiling program to increase ore production and provide a reserve. It was expected that this increased production would come largely from small independent operators. The latter are not equipped for core drilling, and thus have only limited reserves. The ores are mined as found in exploratory workings, and such workings are not driven far beyond the limits of mineralization in searching for new orebodies.

Under such conditions it was ap-

parent that an exploration program would be necessary to increase production; and the Bureau of Mines, recognizing this need, made plans for and started one in April 1943. Under this program it was planned to drill in the vicinity of workings of operating mines in which ore reserves were approaching exhaustion to find extensions of existing orebodies as well as new orebodies. The expectation was that such drilling would result in the earliest production, would find the most reserves for the amount of work done, and would induce operators to continue instead of abandoning properties when all ore in sight had been mined. However, this drilling was to be only the first step in a broad program of determining trends of ore occurrence by which it was hoped eventually to limit prospecting to a restricted area where the percentage of holes in ore would be high.

Choices of drill sites have been made upon recommendation by the Geological Survey and Metals Reserve and as the results of examinations made at the request of claim owners.

The Bureau has completed approximately 39,000 ft. of diamond drilling on 40 different properties in the Colorado-Utah area. This drilling has indicated a substantial tonnage of ore averaging 1.25 percent V_2O_5. Reserves are estimated on the basis that minable ore averages at least 1.25 percent V_2O_5 for a minimum thickness of one foot. The ore grade has been based on assay returns, and in mining out reserves indicated from drill-hole data it generally has been found that the tonnage and grade are even higher than those estimated. Considerable ore has already been mined from the reserves indicated by Bureau work, and practically all deposits in which ore has been so indicated have been developed so that this ore can be mined as needed.

The carnotite usually occurs as 2- to 6-in. layers, horizontal or rolling. The ore is generally from the outcrop taken through small adits, with machinery limited to portable compressors and jackhammers. It drills and breaks easily and the walls stand well.

Treatment of the Ores

Some success in concentration has been attained in Bureau investigations. Dry differential grinding of carnotites from Colorado and Arizona (containing 2.3 to 4.7 percent V_2O_5) followed by air separation effected recoveries from 70 to 78 percent at a concentration ratio of 3 to 1 and in one case 86.3 percent at a 2½ to 1 ratio.

ONE OF THE PROSPECT TRENCHES in Cottonwood Canyon, in Lincoln County, Wyo. The timbering serves to hold back the surface material.

Flotation tests on a Nevada ore containing 1.7 percent V_2O_5, chiefly as cupro-descloizite, showed that concentrates with 8.82 percent V_2O_5 can be made with 88 percent recovery of the vanadium.

A vanadinite ore from Arizona assaying 0.35 percent V_2O_5 proved susceptible to flotation. A concentrate containing 15.4 percent V_2O_5 and 59.7 percent Pb was produced by standard procedure, with recoveries of 75 and 92.3 percent, respectively.

Although some "carnotites" may be mechanically concentrated, it is generally true that they contain various alkali vanadates and refractory vanadiferous silicates that do not respond well to gravity treatment or flotation. The chemical roast-leach process is used in treating them, and is applicable to all types of vanadiferous sandstones. For those low in lime (less than 1.8 parts $CaCO_3$ to 1 part V_2O_5) and free from vanadium silicate minerals, such as roscoelite, it is unnecessary to add pyrite, the roasting temperatures may be reduced, and use of soda ash in the leach water is omitted.

Where ore from several deposits is treated in one plant it is bedded to a uniform composition. Two to five percent of pyrite is added to ore from the stockpile, and after crushing, the moisture is regulated to 1 to 3 percent by adding water or by drying. The product, after grinding to minus 10 mesh, is mixed with 6 percent of ordinary salt and roasted at about 900 deg. C. (800 deg. for low-lime ore), which converts part of the lime to insoluble sulphate and makes the vanadium soluble. The hot-roasted product is treated with sodium carbonate solution, which dissolves the vanadium and converts any calcium chlorate formed in the roaster to insoluble calcium carbonate.

The filtered solution is heated and sulphuric acid added to slight excess, heating being continued until all vanadium is precipitated as "red cake." After washing, the "red cake" is fused to a "black cake," which contains about 90 percent V_2O_5.

Treatment of the complex molybdenum-vanadium-gold-silver-lead ores from Arizona starts with the process developed by the Bureau for treating vanadinite, which involves smelting with soda ash and coke to produce metallic lead and a slag in which the vanadium is water-soluble. The gold and silver go with the lead into metal and into a small portion of matte. The molybdenum is dissolved with the vanadium and separated as follows: Part of the solution is evaporated to dryness and the rest is then mixed with the dried salt and agitated for several hours. Double decomposition results, by which vanadium precipitates and molybdenum dissolve. The residue, containing 20 to 25 percent V_2O_5 with less than 2 percent MoO_3, is shipped.

Idaho-Wyoming Deposits

Of the newly discovered deposits of low-grade ore, perhaps the most promising are those of the Idaho-Wyoming vanadium area, not yet exploited for their vanadium content. Some byproduct vanadium is being recovered, however, from the same phosphate rock formation at Conda, Idaho, by Anaconda's phosphate operations. The process consists of treating the ore with sulphuric acid, which extracts phosphoric acid and about 65 percent of the contained vanadium. Treatment with sodium chlorate precipitates impure phosphovanadic acid. The precipitate is treated with milk of lime and soda ash under carefully controlled conditions to form a sodium vanadate solution from which a high-grade vanadium product is precipitated by heat and the addition of sulphuric acid.

Exploration has determined that

the Phosphoria formation contains a large amount of vanadium-bearing shale, which is a potential source of vanadium. This formation extends over a large area and has been explored in only a few places. The outcrops of Sublette Ridge and the Salt River Range in Wyoming and the Paris-Bloomington area in Idaho have been partly developed by trenches and adits. Several million tons of vanadium ore containing 1 percent V_2O_5 are indicated. This area is apparently the largest potential source of vanadium in the United States.

The ore's refractory nature poses a difficult metallurgical problem, which is being investigated in the Bureau laboratories at Salt Lake City. It has been found that about 85 percent of the vanadium and phosphorus can be extracted by roasting the ore with salt (NaCl) and pyrite. The roasted residue is water-leached, which dissolves most of the vanadium; then leached with sulphuric acid, which removes most of the phosphorus. Two products, one high in vanadium and the other suitable for use as a phosphate fertilizer, have been thus recovered.

Other Sources

Another vanadiferous shale deposit was recently explored by the Bureau in the Camp Floyd mining district, Tooele County, Utah. The results have indicated that the vanadiferous carbonaceous shale bed is widespread, probably covering several square miles. A thickness of about 5 ft. is indicated, although it may vary somewhat over a large area. Metallurgical tests have not yet resulted in a satisfactory method for recovering the V_2O_5 content.

The Bureau has recently discovered vanadium associated with greenish mica that forms an important constituent of the graphite ores occurring near Ashland, Ala., which may be an important source. The little metallurgical research done indicates that a concentrate containing 0.5 percent V_2O_5 can be obtained as a byproduct of the local graphite operations. Possibly the concentrate grade can be increased. Methods for recovering vanadium are being studied at the Bureau's College Park Station laboratories, in Maryland.

The demand for vanadium created new interest in the possibility of recovering this metal from titaniferous magnetites occurring in New York and elsewhere. The most feasible method appears to be to recover the vanadium in pig iron, which could be blown in a converter to produce a slag with enough vanadium for the production of ferrovanadium in another furnace operation. Tests in an experimental blast furnace at the Bureau's Minneapolis station indicate that 87 percent of the vanadium can be recovered from the pig iron. Fairly satisfactory operating conditions were maintained as long as the titania content of the slag did not exceed 10 percent.

Although no commercial production of vanadium has been made from domestic asphalt and petroleum deposits, the soot and flue ash from smokestacks and boilers of tankers and power plants using Venezuelan oils continue to be a source of material containing as much as 34 percent vanadium pentoxide. Domestic vanadium-bearing petroleum and asphalts are therefore a small potential source.

The following treatment plants have contributed to the production of vanadium for war: That at Durango, Colo., operated for Metals Reserve by U. S. Vanadium Corporation (started production in September 1942) and the Monticello, Utah, plant, operated for Metals Reserve by the Vanadium Corporation of America (started in August 1942). These plants ceased operations in the spring of 1944 because of lessened demand. In addition there were the Uravan and Rifle, Colo., plants of the U. S. Vanadium Corporation; the Vanadium Corporation of America plant at Naturita, Colo.; the North Continent Mines, Inc., plant at Cedar, Colo.; the Nisley & Wilson vanadium plant at Gateway, Colo.; the Blanding Mines Co. plant at Blanding, Utah, which started operations early in 1940; the Mammoth-St. Anthony plant at Tiger, Ariz., and the Anaconda Copper Mining Co.'s plant at Anaconda, Mont.

Rhenium Reported in North Carolina Molybdenite

FOLLOWING ITS PRACTICE of examining the mineral deposits it explores for rare elements, the U.S. Bureau of Mines found that the molybdenite in Halifax County, N. C., carries rhenium in concentrations well above the amount previously known. M. S. Sheftel, of the Bureau's Analytical Laboratory, reports rhenium values of 50, 80, and 90 parts per million (or 150 calculated for pure molybdenite), compared to the normal of 10 parts per million. Since previous determinations of rhenium give values ranging from 1.2 to 65 p.p.m., with 597 p.p.m. as the highest for a few fissure specimens, and 7.46 p.p.m. for a molybdenite concentrate, these concentrations can be regarded as unusually high. The spectrographic examination left little doubt of the presence of large quantities of rhenium, since all members of the 3460 A.U. triplet, 3451.88, 3460.47, and 3463.72, were very strong.

Rhenium is a rare element of the manganese family. The existence of two members of the manganese family, eka and dvi manganese, was long suspected, and Mendeljeeff left places (43 and 75) for them in the orderly table of periodic system. In 1925 Noddack and Tacke made an effort at the concentration of the element dvi-manganese from platinum ores and from columbites, and definite evidence was announced by Berge and Tacke for its presence in a chemical concentrate. The name rhenium was assigned to it. However, the results of these chemists were declared inconclusive, and discovery of element 75 was claimed by J. G. F. Druce and his co-workers U. Dolejsek and J. Heyrovsky, who found rhenium obtainable as $KReO_4$ (potassium perrhenate), a colorless stable salt, analogous with potassium permanganate. Prandtl was unable to find element 75 in the manganese salts. The commercial production of rhenium from molybdenum ores was commenced in Germany in 1931.

Rhenium has useful properties as a catalyst and for electrical filaments. It may be alloyed with rare metals, and can be deposited electrolytically. Its resistance to hydrochloric acid is an important and unusual property. An impressive list of patents indicates that the metal and its compounds may become commercially important. Some proposed uses are for electric heating devices, incandescent lamps, radio and power tubes, pen nibs, and in the manufacture of chloroform and production of anti-knock fuels.

Bunker Hill Mine Installs Modern Power System

JOHN B. HUTTL,

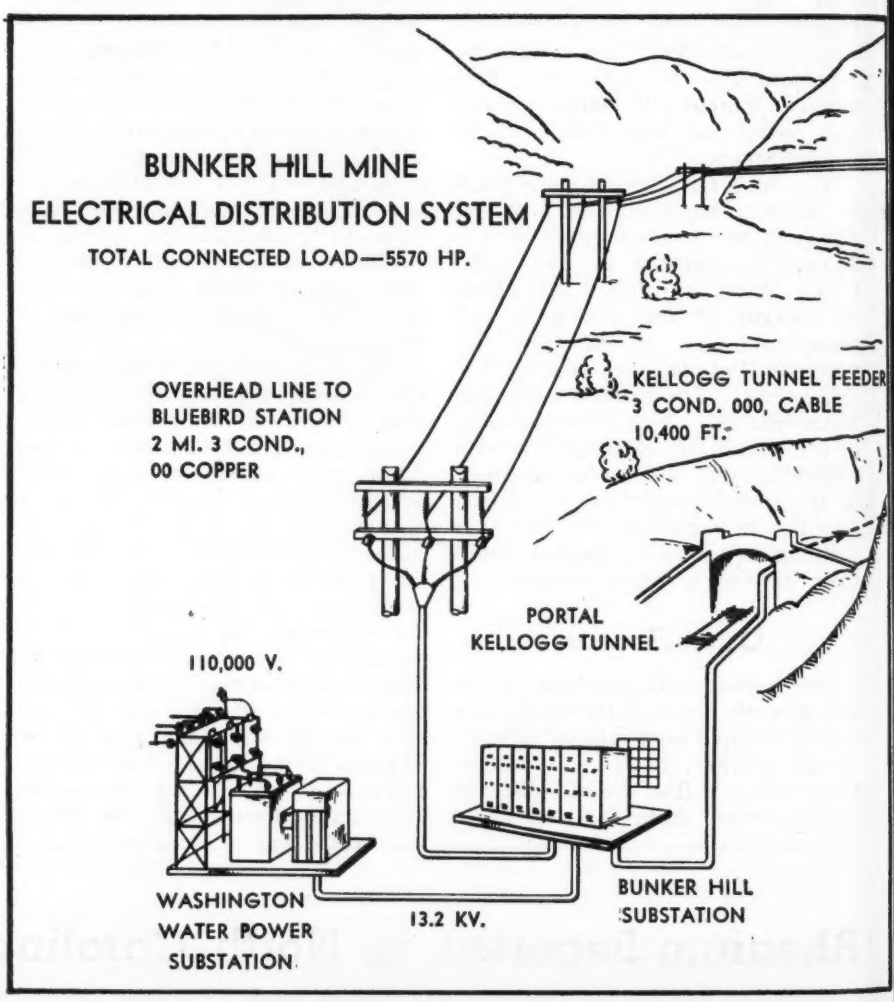
Associate Editor

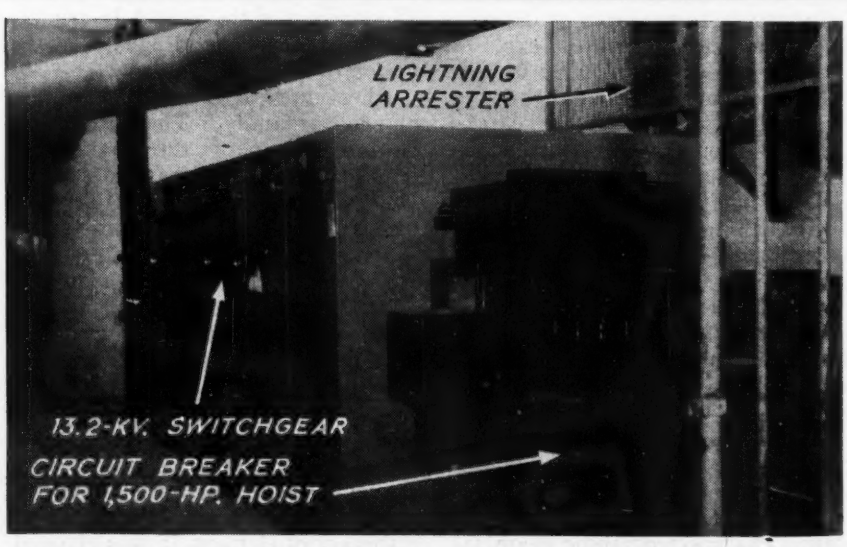
LIKE MOST large non-ferrous metal producers, the Bunker Hill mine of Bunker Hill & Sullivan Mining & Concentrating Co., at Kellogg, Idaho, is a product of evolution. Starting as a small prospect in the early 80's, employing but a few men using simple hand tools, it was gradually expanded into the large mechanized mining operation it is today. As the mine workings advanced laterally and in depth, small units were added to existing hoisting, pumping, ventilation, and other equipment during each phase of expansion to meet the requirements imposed by new conditions.

More Power Required

For instance, natural ventilation was found adequate for many years. Later, as new sections were opened, it became necessary to install fans at strategic points to force air into the more distant areas. Further expansion brought about mechanical ventilation, and today, with a considerable section of the mine below sea level, high humidity and temperatures make it imperative to use air-cooling units. Electric power supply, and pump and hoisting problems, were handled in a like way. However, this practice cannot be carried on indefinitely, for eventually the addition of small units to existing machinery will prove impractical and uneconomic.

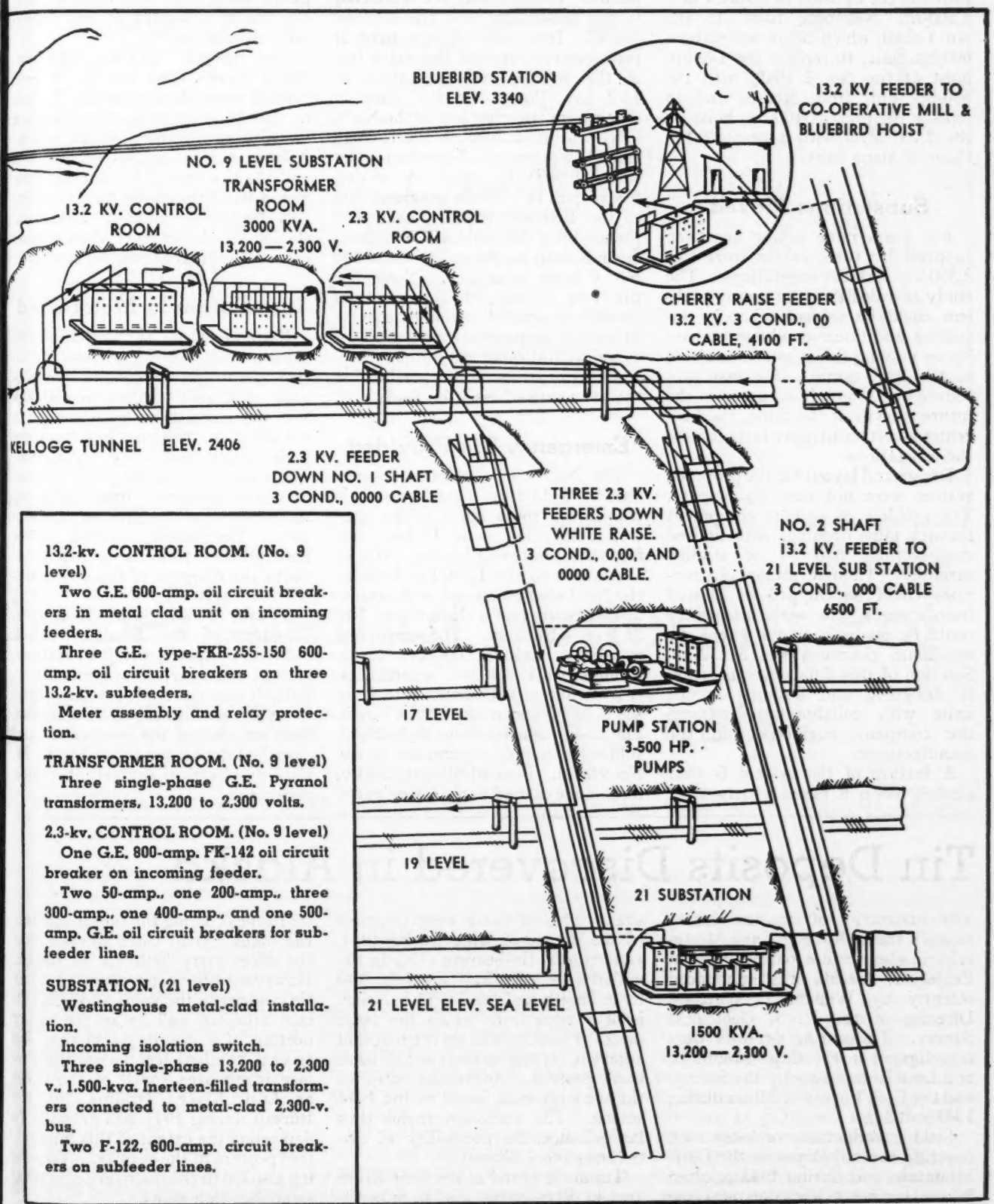
This condition was reached at Bunker Hill in 1937. In consequence, the engineering department made a thorough study of existing underground machinery and power supply facilities, which resulted in the adoption of the long-range program of plant modernization now being carried out. As conceived, it involves the installation of a dependable and adequate power supply system, and the replacement of multiple small units with large and modern equipment. As an example, it was decided in 1942 to eliminate a large number of small pump units





New installation of metal-clad switchgear in 13.2-kv. control room on the No. 9 level is neat, compact, and completely modern.

Power facilities in growing mines cannot be expanded indefinitely without incurring excessive line losses and general inefficient performance. Operators of the Bunker Hill mine solved this problem by surveying underground machinery and power facilities, adopting a long-range program of modernization, and installing this power distribution system.



13.2-kv. CONTROL ROOM. (No. 9 level)

Two G.E. 600-amp. oil circuit breakers in metal clad unit on incoming feeders.

Three G.E. type-FKR-255-150 600-amp. oil circuit breakers on three 13.2-kv. subfeeders.

Meter assembly and relay protection.

TRANSFORMER ROOM. (No. 9 level)

Three single-phase G.E. Pyranol transformers, 13,200 to 2,300 volts.

2.3-kv. CONTROL ROOM. (No. 9 level)

One G.E. 800-amp. FK-142 oil circuit breaker on incoming feeder.

Two 50-amp., one 200-amp., three 300-amp., one 400-amp., and one 500-amp. G.E. oil circuit breakers for subfeeder lines.

SUBSTATION. (21 level)

Westinghouse metal-clad installation.

Incoming isolation switch.

Three single-phase 13,200 to 2,300 v., 1,500-kva. Inerteen-filled transformers connected to metal-clad 2,300-v. bus.

Two F-122, 600-amp. circuit breakers on subfeeder lines.

serving the upper levels and to replace them with three large centrifugal pumps, each powered by a 500-hp. motor, housed in a central station on the 1,700 level. A similar installation will be provided on the 2,300 level.

Hoisting problems created by increased depth and production resulted in the decision to install a new 1,500-hp. Nordberg hoist at the No. 1 shaft, which is now served by a 600-hp. unit; to replace the 150-hp. hoist at the No. 2 shaft with the 600-hp. unit from No. 1; and to replace the present 100-hp. hoist on the 2,100 level with a new 400-hp. Coeur d'Alene hoist.

Substations Moved

For years mine power has been supplied by three cables from two 2,300-v. surface substations. The study revealed that the supply problem could be solved either by installing additional conductor capacity or moving the substations closer to the load center. The last procedure was adopted because with the future growth of the mine, the load center is certain to move farther from the substations.

Design and layout for the proposed system were not easy to prepare. The problem of moving equipment through mine openings with limited cross-sections had to be studied carefully. Though minor obstructions could be chipped or blasted from tunnels, no such alterations could be made in shafts where the maximum clearance was 54x52 in. Solution of this difficulty was found in designing and building special units with collaboration between the company engineers and the manufacturers.

A feature of the system is that electric power is taken underground at 13,200 volts. Total connected load is 5,570 hp., but provision has been made for future increase in the load.

Electric power is supplied by the Washington Water Power Co. through two 110,000-v. circuits, one fed from Montana sources and the other from Washington generating plants. Both circuits are connected to the substation near the Kellogg tunnel. Here a 10,000-kva. bank of transformers supplies the main bus in the Bunker Hill substation at 13.2 kv. Power for the mine is taken from the main bus to the No. 9 level substation through the Kellogg tunnel by means of a 3-conductor 000 cable 10,400 ft. long. A second feeder goes in a 2-mile overhead line to the Bluebird tunnel portal, and thence by a 00 cable 4,100 ft. long down a shaft to the main bus of the No. 9 level substation. Normally, the two feeders are operated in parallel, but each has ample capacity to handle the present connected load as well as additions to it in the future. In event of feeder failure, each cable can take care of essential loads.

Emergency Tie Provided

The No. 9 level substation consists of a 13.2-kv. control room, a transformer room, and a 2.3-kv. control room. The main 13.2-kv. bus feeds three outgoing feeders. One of these goes to the 1,500-hp. hoist at the No. 1 shaft, a second to the transformer room, and a third to the No. 21 level substation. The second one supplies a bank of 3,000-kva. transformers with 2,300-v. secondaries. A 3-conductor 0000 cable runs from the 2,300-v. secondary to the bus in the 2.3-kv. control room, from which subfeeders supply equipment in the No. 9 level. Four additional 2,300-v. feeders are carried to the lower levels. One is a 3-conductor 0000 cable going down No. 1 shaft, and the other three are 2.3-kv. feeders, consisting of 0000, 00, and 0 cables respectively, which go down No. 2 shaft. Owing to difference in impedance, it is not practicable to operate the feeders in parallel. However, tie switches are installed at convenient points along them to provide at least two routes of supply to any important installation.

The 6,500-ft. 13.2-kv. 000 line, which travels from the No. 9 level control room down the No. 2 shaft to the 21 level substation, feeds a bank of transformers which supply 2,300-v. current to the No. 19 level and lower levels of the mine. Provision has been made for extending this feeder to another 1,500-kva. station at a lower level when further expansion makes this necessary.

Installation Is Metal-Clad

Equipment in the Bunker Hill substation is a Westinghouse metal-clad assembly consisting of two 600-amp. oil circuit breakers of 250,000-kva. rupturing capacity connected to a 1,200-amp. incoming bus complete with switch and relay equipment. The incoming and outgoing conductors are protected from lightning surges by G. E. Thyrite arrester units. Equipment installed in the underground stations is listed beneath the diagram of the power distribution system.

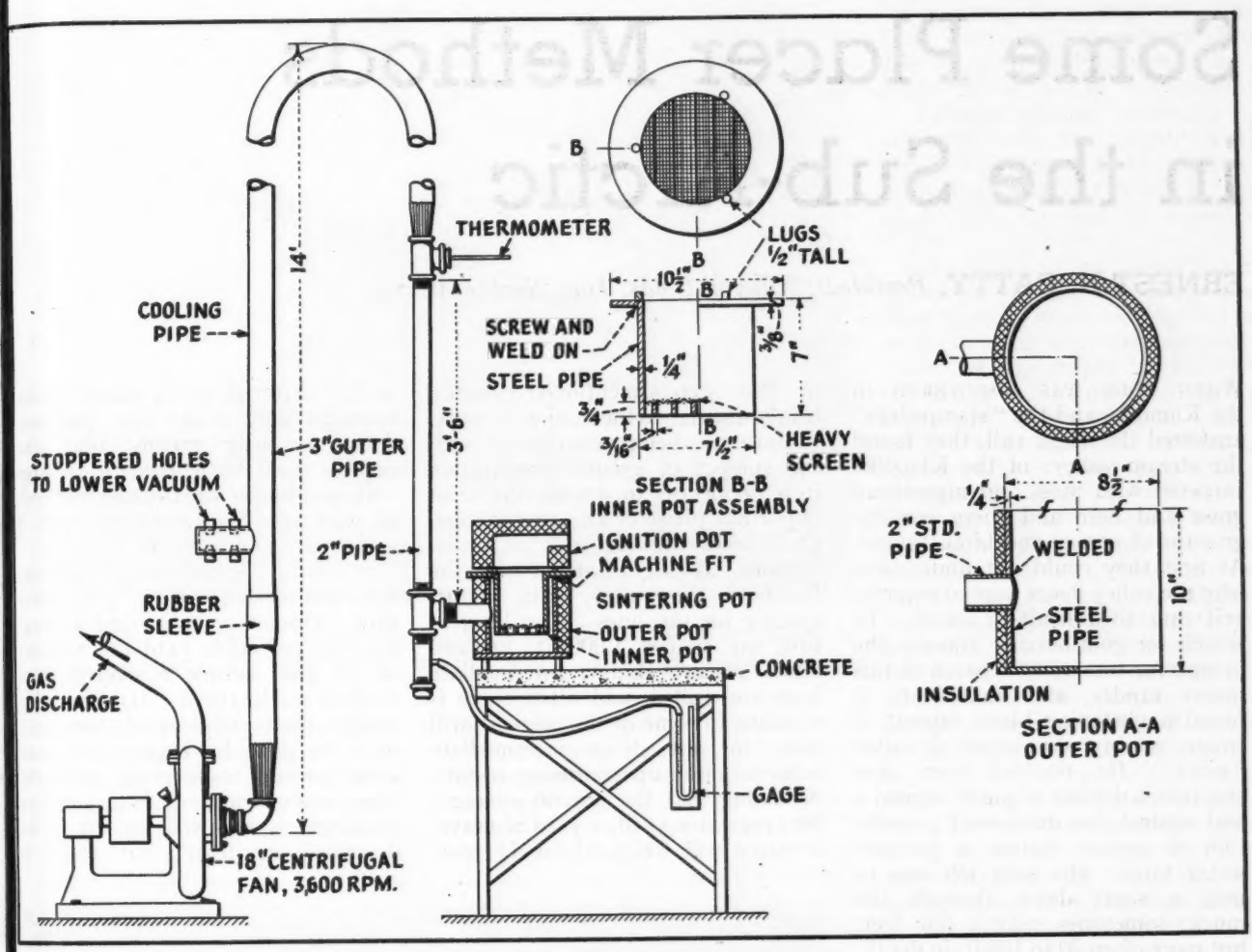
Thanks are due Stanly A. Easton, president of the Bunker Hill & Sullivan company, and J. B. Haffner, general manager, for permission to publish this material. Acknowledgment is made also to A. C. Stevenson, chief engineer of the mechanical and electrical departments, and to L. M. Griffith, electrical engineer, for their assistance.

Tin Deposits Discovered in Alaska

THE DISCOVERY of two tin-bearing veins in the bedrock at Cape Mountain, in the western part of Seward Peninsula, Alaska, was announced recently by William E. Wrather, Director of the U. S. Geological Survey. Tin-bearing deposits were investigated in the Cape Mountain and Lost River areas by the Survey and the U. S. Bureau of Mines during 1943 and 44.

Field examinations of loose rock covering the hill slopes in the Cape Mountain area during 1943 resulted in the further exploration of three sites. Two of these were trenched by the Bureau of Mines during 1944, and exposed tin-bearing veins in the underlying bedrock. One vein, 140 ft. in length and locally 14 in. wide, is of a type from which the large pieces of nearly solid tin ore found in adjacent stream gravels could have been derived. Additional sites of tin ore float were found in the 1944 season. The orebodies found thus far enhance the possibility of discovering more deposits.

Tin ore is found in the Lost River area in dikes, veins, and in mineralized zones cutting the limestone near the dikes. Drill cores showed that the dikes carry little tin at depth. However, other cores revealed a fair tin content in the veins and mineralized area, as well as in the upper portion of a granite mass that lies several hundred feet below the surface in an area south of the dikes at Lost River. Drilling by the Bureau during 1944 was oriented to determine the extent of this mineralized portion of the granite. Trenching also led to the discovery of several small but rich veins.



Experimental Sintering Pot Perfected for Ore Tests

H. R. HANLEY, *Professor of Metallurgical Engineering, Missouri School of Mines and Metallurgy*

AN EXPERIMENTAL SINTERING POT which is practically free from defects is in use in the metallurgical engineering department of the Missouri School of Mines and Metallurgy, Rolla, Mo. It has undergone improvement during the past 14 years.

Two steel pipes concentrically nested to provide an annular zone of approximately ¾ in. comprise the sintering receptacles. The inner pot contains a top flange, machined on the lower surface to provide a tight seal when placed on the top of the outer pot, which is insulated. The suction of the fan is connected to a 3-in. gutter pipe (cooling pipe), which extends vertically to the roof of the building, about 14 ft., and returns to the outlet of the outside pot. A glass thermometer (250 deg. C.) is placed about 3.5 ft. above the pot for observation of relative temperature changes. Four stoppered holes are placed in the pipe for lowering vacuum if and when needed during ignition. The charge is ignited by means of gas and compressed air through an insulated flame distributor.

The bottom of the inner pot consists of steel bars welded to the walls. Two screens are placed on top of these bars—the lower one heavy and the top one a finer insect screen.

The charge is placed on a rubber cloth 4 in. square and mixed with water to the correct degree of dampness. Following effective mixing, the charge is "sprinkled" from a small scoop through ½-in. mesh screen to prevent "mass charging." After ignition (1 minute) the flame distributor is removed, and readings of vacuum and temperature are made at 2-minute intervals. The gas temperature as indicated by the thermometer is an indication of the sintering intensity. The end of sintering is determined by the lowering of the temperature to 60 deg. C.

Some Placer Methods in the Sub-Arctic

ERNEST N. PATTY, *President, Alluvial Golds, Inc., Seattle, Wash.*

WHEN GOLD WAS DISCOVERED in the Klondike and the "stampeders" answered the magic call, they found the stream valleys of the Klondike carpeted with moss and niggerhead grass and here and there scrubby growths of spruce and birch timber. At first they could not understand why the valley floors were so swampy and thus so difficult to travel. To search for gold-bearing gravels, the prospector tore away a patch of this mossy tundra, and underneath it found a glistening black deposit of frozen, muddy ooze which he called "muck." He realized then that this frozen deposit of muck formed a seal against the downward percolation of surface waters—a perched water table. His next job was to pick a shaft down through the muck, sometimes only a few feet, but more often 20 to 100 ft. in depth, until he found the underlying frozen gravels. He attacked these with wood fires, laboriously sinking his shaft a foot or two at a time until bedrock was reached, and it was at the bottom of the gravel and in the upper two or three feet of the bedrock that he searched for the pay-streak of gold-bearing material.

Methods Mechanical

Today, the gold fields of the Sub-Arctic are chiefly mined by mechanical methods with floating gold dredges, or excavated with power shovels and draglines, tractor-mounted bulldozers, and occasionally by hydraulicking. To accomplish this the following preparatory work is necessary:

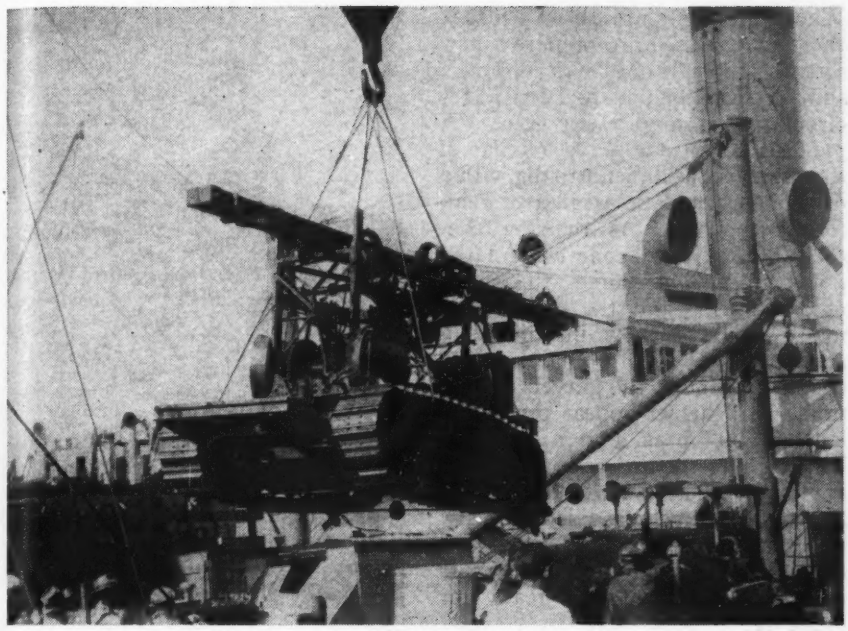
1. Removal of the forest cover of moss, niggerheads, brush, and timber.
2. Stripping off the overlying bed of muck to expose the underlying gravel.
3. Thawing the frozen gravel and the upper few feet of bedrock.

Experience has shown that the key to successful placer mining in the Sub-Arctic is thorough and complete ground preparation. Any attempt to slight or short-circuit any of the steps mentioned usually brings disaster to the mining venture.

However, before continuing with the subject of ground preparation it is important to discuss the most important phase of all—prospecting. Drill holes are laid out as cross-sections at right angles to the trend of the valley, with 100-ft. spacing on the lines. The lines in turn are spaced 1,000 ft. up and down stream. Later, intermediate lines are drilled, and often there is a return to some of the original drill lines to put down intermediate holes to clear up confusing results. Assuming that the ground averages 50c. per cubic yard, a yard of gravel in place will weigh about 1½ tons, so the material to be mined really averages only about 35c. per ton. This obviously means that the deposit must be worked on a large scale and simple streamlined methods of gold recovery must be used if success is to be assured.

Standard procedure is to use 6-in. drill casing with a 7½-in. drive shoe. Obviously, in ground averaging 50c. per cubic yard the amount of the gold sample recovered from the hole will be small. If dependable results are to be secured, the work must be done by experienced men using precise engineering methods. The conventional drilling practice employed is too well known to be described in detail, but there is

A churn drill at work on ground along Woodchopper Creek, Alaska. At the right is the "dog-house," where the panner works down the samples. This is mounted on skids and is moved by tractor.



Off for Alaska—A caterpillar-mounted prospecting drill is being swung aboard a boat bound for the North, at a dock in Seattle.

one point of interest—namely, the placer deposits available for exploitation in the North Country in general are frozen, and as a consequence much simpler to evaluate than thawed gravels. Operators have learned to use open holes for drilling frozen ground. Only one joint of casing is put into the hole to seal off surface waters, and the remainder of the hole is drilled without casing. An experienced driller will put down a hole through the frozen ground often as smooth as the inside of a gun barrel. There may result a certain amount of ravelling in the hole when going through gravel which was relatively dry when frozen, but usually this is not a serious problem. After the hole is completed, measured quantities of water are poured into it and float readings are taken. From these water measurements the volume of gravel removed from the hole at any particular horizon can be calculated accurately. Placer engineers unfamiliar with frozen ground are reluctant to dispense with casing, but open-hole drilling is standard procedure by engineers experienced in the North Country.

To prepare the prospected ground for mining, it is necessary first to strip off the moss and forest cover. Timber more than 5 in. in diameter at the butt is cut and saved for camp firewood. Stumps are uprooted with a bulldozer, and where heavy stands of timber are encountered the stumps are stacked around a centrally situated gin pole with a tractor-mounted double-drum winch, and later burned. Moss and tundra are stripped from the area with dozers and piled in large windrows on each side of the area to be mined. The moss usually is stripped between May 15 and June 15, as later in the summer the surface becomes too soft for tractor work. On creeks which have large supplies of water, the moss is often removed by hydraulic methods. This is generally done late in summer when the thaw has penetrated a foot or more beneath the surface.

Removing the Muck

When the insulating cover of moss is removed, the shiny black surface of the frozen muck is exposed to the sun. During an average summer day this will thaw to a depth of four inches the first 24 hr. The thaw will gain an additional depth of two to three inches the second day, with progressively less penetration for the succeeding days. The secret of muck stripping is to let the sun thaw a layer of muck to a depth of four to six inches, and then sweep off the thawed ooze hydraulically and expose a frozen face to the sun. To accomplish this, a ditch is constructed along the hillside to bring gravity water to a point 100 ft. or more vertically above the stripping area. From the penstock on the ditch, slip-joint hydraulic pipe is laid to the area, with branch lines stretching across the valley floor. On these branch lines No. 2 hydraulic giants are set up with a spacing determined by the spouting distance of the giants. Each unit sweeps a circle of muck. The muck is finely divided and is easily carried off in suspension to a drainage channel previously established over the length of the area. The stream of water leading from the stripping area is inky black from its load of suspended muck.

Ice dikes and ice lenses are included in the muck. These thaw more rapidly than the muck, and soon the stripping area assumes a "badland topography" with many pot holes, miniature canyons, and waterfalls. The work is carried out on a 24-hr. basis. When the nozzle man or piper has stripped one section down to "frost," he shuts off the water and moves to another hydraulic giant. As a consequence, two or three nozzle men can tend a dozen set-ups. Through experience certain standards of performance have been evolved which enable the engineer to gage the efficiency of the operation and to estimate the time required to strip a specified area. This is expressed in terms of water duty. For example, when it is said that a certain muck deposit will require a water duty of 10 or a duty of 15 per miner's-inch-day, it means that each miner's inch of water delivered to the stripping nozzles for 24 hr. will remove 10 or 15 cu.yd. of muck.

As the work progresses, the underlying gravel surface begins to appear at various points. It is here, too, that skeletal remains of animals may be found, often accompanied by bits of hide and flesh which have been in refrigeration for thousands of years. As the lower horizons of the muck begin to thaw out the stench of decay is often present. These animals apparently roamed the ancient gravel bars and were trapped and buried by the muck. Often when the gravel surface is exposed there are found ancient beaver dams, or the stumps of a prehistoric forest rooted in the gravel.

Cold Water Thawing

When the muck is removed a flanged waterline is laid upstream and downstream along one side of the area. The flanged feeder line is usually 14 to 16 in. in diameter, and at intervals of 27 ft. 6-in. flanged outlets are provided for the thawing lines laid across the exposed gravel surface. The thawing lines are 6-in. slip-joint hydraulic pipe, often reduced down to 4-in. pipe toward the end. One-inch hose

lines are tapped off the feeder lines and attached to gooseneck pipes connected to the thawing points. Points are heavy-duty 1-in. pipe with a chisel bit welded on one end. Water flows down the pipe, and is discharged into the gravels through two openings, one in each face of the chisel bit. The point driver connects up the thawing point to the line, opens the valve, and then forces it into the gravel surface. If the upper 2- or 3-ft. section of the gravel is thawed, a pipe wrench is placed on the point, which is twisted down into the gravel until frost is encountered. When this is reached, an anvil-like clamp is secured to the thawing point, which is subsequently forced deeper into the gravel by a sliding weight lifted and dropped onto the anvil clamp by the point driver.

Driving the Points

An experienced driver does not try to drive the point into frozen gravel, for that would be slow and difficult work, but instead he forces the point down until frost is encountered and then moves along the line to the next point until he has made the rounds of perhaps 50 points. In a few hours he returns to the first point and finds that the jet of water spurting from the bit has thawed the gravel down three or four inches ahead of the bit. Again he drives the point ahead until it is on frost, and repeats the aforementioned procedure. During the driving period the water usually is carried under 10- or 15-lb. pressure, but when the points have reached bedrock the pressure is reduced to 4 or 5 lb. to obviate the possibility of the water returning quickly to the surface. What is desired is for the water to soak slowly through the frozen gravel and transfer its heat to the material to be thawed.

The points are geometrically spaced so that each point forms the apex of an equilateral triangle with sides 15 ft. long. Any single thaw point in the field is seldom advanced more than one or two feet in a single day. Assuming then that the gravels are 20 ft. deep, it requires about 12 days to get the points down to bedrock. At this stage the thawed area around each point is cone shaped, with the tip of the cone on bedrock. By this time the thaw from adjacent points has coalesced in the upper gravels. Water is bubbling up at many points on the surface, and to permit the point driver to move around without sinking into the water-soaked gravel, poles are placed on the ground. When the points are all on bedrock the crew moves on to prepare a new setting, though one man on each shift remains behind to keep water circulating through every point. A plugged point may leave a pillar of frozen gravel as difficult to dig with a dredge as would be a pillar of reinforced concrete. As thawing proceeds, the thawed cone around the point gradually assumes the shape of a cylinder, and the water from many points is now intermingling and setting up underground drainage channels through the gravel. Next, prober and helper appear carrying a ladder, steel bars, and a hammer. The centers of the equilateral triangles are where one would expect to find frozen gravel, provided the thaw had not been complete. Hence the first probing is done at these points to see if the gravels are ready for dredging.

The cost of water-thawing frozen gravels varies considerably, depending on local conditions. In general, it ranges from 5 to 8c. per cubic yard of gravel. As to water consumption, each point requires one-half of a miner's inch, which means that 500 in. of water are required to operate 1,000 points. The capital cost of installing a thawing plant will average about $10 per point.

Water temperature readings are a matter of daily routine. Save for some remnants of winter ice near the headwater, ice is absent from the streams around May 15 of the year. If the thawing plant is fed by a ditch several miles long, a water temperature of 38 deg. F. may be found at the intake of the ditch, and 40 deg. F. at the penstock. The water enters the frozen ground in this case at 40 deg. F. and emerges at about 36 deg. F., giving up 4 deg. of heat. These low temperatures occur only at the start of the season. Obviously, the rate of thawing is rather slow. As freezing temperatures may prevail at night during the latter part of September, there are only about 120 thawing days for a full dredging season. The rate of thaw is greatly accelerated in July and August.

Natural Thawing

Another interesting matter encountered in northern dredging fields is that of "natural thaw." The stream meandering along the valley floor has eroded away the muck along the channel, and as a consequence runs on the gravel surface. In some places the meandering of the stream has eroded away large sections of muck, and wherever these gravel bars are encountered they are naturally thawed. As some of the company dredges were operating in relatively shallow gravels, 12 to 20 ft. deep, the possibility of developing natural thaw and thus eliminating or reducing the cost of water thawing was intriguing. Discussion of the problem with other operators elicited rather conflicting reports, and mostly mere opinions. Nobody had actually prepared a long-range program to develop natural thaw. Conducting experiments on ground stripped of muck some distance ahead of the dredge, it was found through "probing" late in the fall that the summer sun and rains had thawed the exposed gravel to an average depth of 7 ft. Would it freeze back during the ensuing winter? The same ground was probed early the following spring, and found frozen. However, there was one surprise—it was found that the winter frost had almost all disappeared by June 15 and the thaw reached down to permafrost again.

Later work showed that if frozen gravels, 10 to 20 ft. deep, are thoroughly stripped of muck and left exposed to the summer sun for three seasons, the gravels and the upper two or three feet of bedrock are completely thawed, and ready for dredging. Winter frost will freeze back to a depth of 5 to 7 ft. However, this frost is rapidly destroyed

The point driver forces the thawing point deeper into the gravel by lifting the sliding weight and dropping it on to the anvil clamp (at knee level). The handle serves for twisting the drill. Additional pipe (1-in., heavy duty) can be screwed on as required.

This dredge, belonging to Gold Placers, Inc., and working at Coal Creek, Alaska, has a pontoon hull and is of all-steel construction. It is equipped with diesel power.

when warm weather returns. To get the dredge into operation as early as possible in the spring, one water thaw of about 500 points is put in to break up a limited area of the surface frost mentioned. When sufficient ground is ready to supply the dredge until June 15 to 20, the thawing plant is dismantled, and operations depend on natural thaw for the remainder of the season. It is obvious that this practice has reduced operating costs to an important degree. This general conclusion must be applied with caution, as the character of placer deposits varies. On very shallow deposits where the gravel is coarse, two years' exposure of the gravel surface would probably be sufficient. On deeper gravels, or deposits carrying large sand lenses, a longer exposure would be required.

As to the subject of dredging operations proper, the process is so well known that it will be of more interest to discuss the unusual dredging problems common to the Sub-Arctic. When placer ground is suitable for mining with a conventional bucket-line dredge, no other form of placer mining can compete with this machine. In the Sub-Arctic, stripping and thawing the gold-bearing gravels costs from 10c. to 15c. per cubic yard of gravel mined. This ground preparation cost alone is more than the cost of dredging in California. Transportation costs to the Northland are very high, and vary from $45 to $100 per ton from Seattle or Vancouver to Fairbanks, Alaska, or to Dawson, Y.T. Many of the dredges are powered with diesel engines. Oil for these units costs 7c. per gallon at the port of Skagway, Alaska, but freight rates from Skagway to some of the dredging camps are as much as 20c. to 25c. per gallon. It was expected that the U. S. Army pipeline from Skagway to Whitehorse, the Canol project with its pipe line from Norman Wells to the refinery at Whitehorse, and the pipe line from the refinery to Fairbanks would provide the mining camps with lower-cost diesel oil and gasoline. This has not happened.

Yukon Operations

Mining in the Yukon depends chiefly on river transportation, usually between June 1 and early October. Needs must be anticipated a year in advance, and large inventories must be carried. For example, one of our single dredge installations required a capital investment of $350,000, and for this operation we must carry over the winter an inventory varying between $50,000 and $75,000. The mining season each year is so short that breakdowns which necessitate suspension of mining for more than a few hours are intolerable. Dredges operating in shallow ground generally start digging about June 1, and close down Oct. 15, when freezing weather cuts off the water supply. Dredges working in deep ground have before them ground thawed a year ahead, and to lengthen the dredging season a steam thaw is installed in the spring to break up surface frost. Some dredges handling deep gravel operate as long as eight months each year. Before the dredging season opens it is imperative that all dredge equipment be thoroughly overhauled, and worn parts replaced. This meticulous care has its reward, and some dredges go through the season with an operating record of 97 to 99 percent of the total possible elapsed time. This excepts time lost for clean-ups.

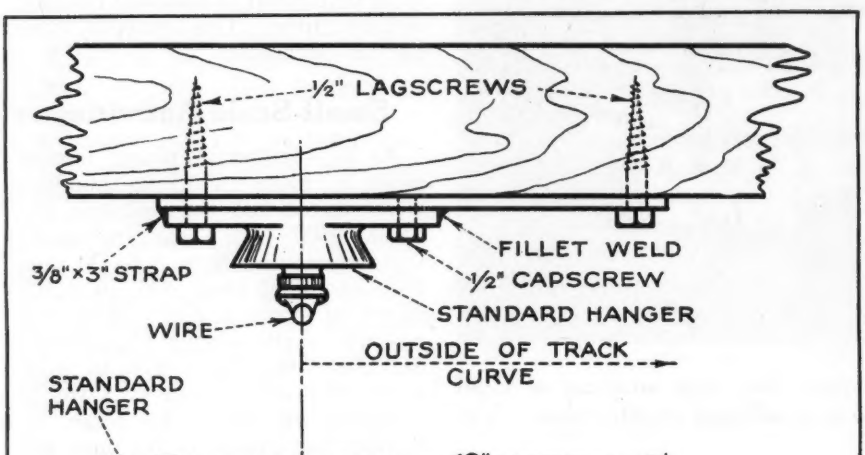
Small-Scale Activities

As to small-scale placer mining projects, more than one hundred were started and active during the period 1937–42. These are operations employing from 6 to 20 men and handling from 500 to 1,500 cu.yd. of gravel a day. Many use modern earth-moving equipment, and gravel washing is done in sluice boxes 30 to 48 in. wide on a trestle mounted on skids. In some instances the gravel is fed into the boxes by dragline excavators and power shovels, and in others by hydraulic means if the sluice box is set on bedrock. Where water is scarce, tractor-mounted dozers push the gravel to the feed end of the sluice.

Scattered through the mining districts of interior Alaska are gold-bearing areas too small for or otherwise unsuited to conventional dredging. Here, the small mine units mentioned previously are found working bench areas where removal of tailings can be accomplished by dumping them over the edge of the bench, on the smaller tributary streams often where the gravel is only a few feet thick and will thaw out quickly under the summer sun if the muck is ground-sluiced away, and on large sections of ground where Nature has sluiced off the muck. They seldom carry out detailed prospecting, and often depend on local history and a few prospect shafts. Naturally, many are doomed to failure, but their mining plants are mobile and owned by stout-hearted men. If they fail the first time they will usually fold their tents and steal away over the winter snow to set up the equipment at some other location the following spring. Usually one of the owners acts as the foreman, the other as the dragline operator, while the third handles the tractor. Most of the operations have been originated by progressive individuals, small groups of experienced placer miners, or by small organizations created to finance some fellow who has earned a local reputation as an experienced, dependable miner.

OPERATING IDEAS

Trolley Wire Hangers Modified for Curves



STANDARD TROLLEY WIRE HANGERS mounted to drift caps above track curves showed a tendency to pull loose at the Tamarack mine, in the Coeur d'Alene district. Lagscrews mounted on the outside of the curves pulled out because of a side tension exerted on the hanger by the trolley wire. Dick May reports that this tendency was corrected by welding a $\frac{3}{8}$x3x12-in. strap to the standard hanger as illustrated.

A hole was drilled and tapped for a $\frac{1}{2}$-in. capscrew at *A*, and three $\frac{9}{16}$-in. holes were drilled for $\frac{1}{2}$-in. lagscrews at *B*. When trolley wire hangers were mounted as shown with the extended portion of the strap to the outside of the curve, the lagscrews remained securely in position.

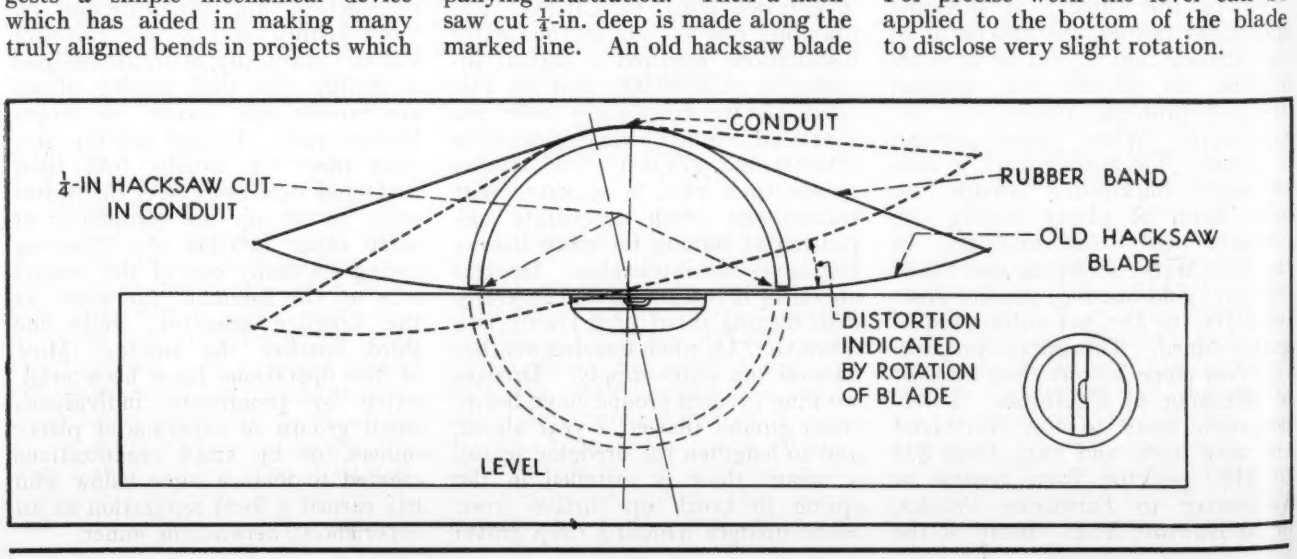
By increasing the distance between the outside lagscrews and the center line of the trolley wire, the resisting moment exerted by the screws is increased without increasing the strain on the screws.

Level Employed to Align Conduit Bends

ORDINARILY, when a workman bends conduits into offsets, elbows, and saddles, he must rely upon careful sighting to prevent distortion or twisting as successive bends are made. Paul C. Ziemke, 101 Kimball Lane, Oak Ridge, Tenn., suggests a simple mechanical device which has aided in making many truly aligned bends in projects which employed powered conduit benders.

After the first bend has been completed, a horizontal line is marked across the center of one end of the conduit. This mark is made with the aid of a level held across the end of the conduit as shown in the accompanying illustration. Then a hacksaw cut $\frac{1}{4}$-in. deep is made along the marked line. An old hacksaw blade is then inserted into the cut and held in place with a rubber band as shown.

When a second bend is made, any distortion will be indicated by twisting of the inserted blade from a true horizontal position, and can be corrected before the bend is completed. For precise work the level can be applied to the bottom of the blade to disclose very slight rotation.



Gage Indicates Pulp Density

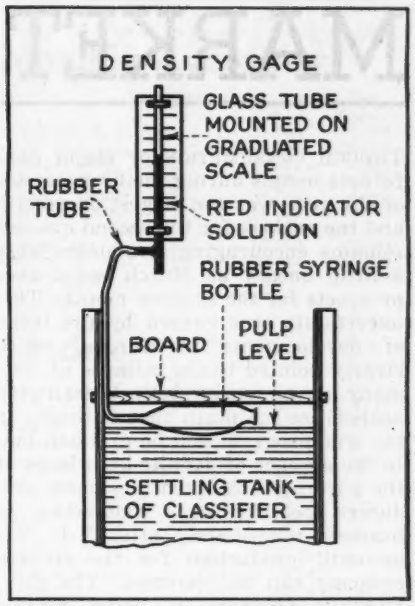
PVT. ROBERT A. RICE, North Camp Hood, Texas, submits an unusual density gage which was developed in the Silver Crescent mill, in the Coeur d'Alene mining district, and used successfully on 12 different ores.

As shown here, a syringe bottle with rubber tube attached was filled with a colored solution and partly submerged in the settling tank of a mechanical classifier. The rubber tube was connected to a gage consisting of a glass tube mounted on a graduated scale. A board was set slightly above the pulp level of the tank to hold the bottle securely in place.

With a constant pulp level, any change in pulp density varies the buoyant effect on the lighter solution in the bottle and produces a change in the level of the colored solution in the gage glass.

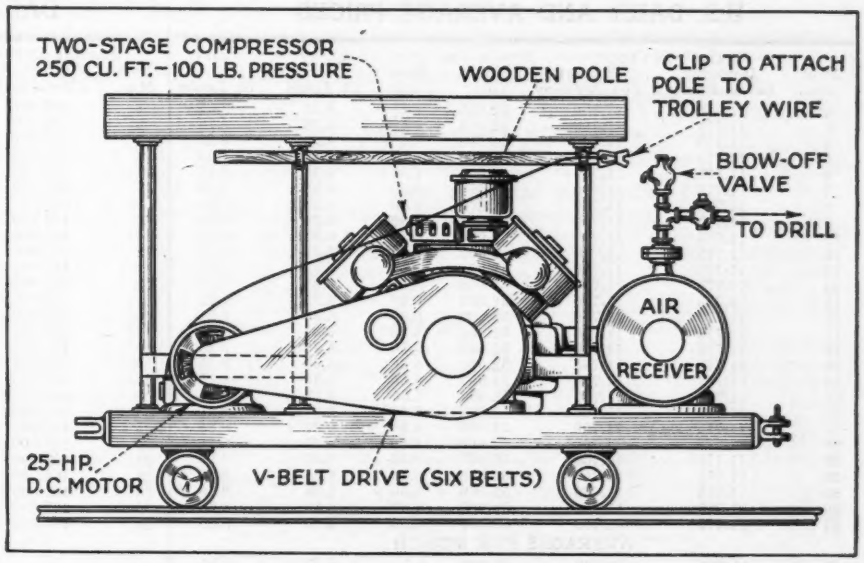
The graduated scale on the gage was calibrated as follows: Samples of pulp at various densities were weighed. Pulp densities of these samples were calculated, and marks were placed on the scale to correspond to the calculated densities.

The solution in the bottle consisted of water made alkaline by the addition of sodium carbonate. Phenolphthalein solution was added to color the liquid a bright red. The gage was thus visible from various points in the mill and enabled operators to note at a glance any changes in the density of the pulp in the settling tank.



Portable Compressor Mounted on Mine Truck

THE PORTABLE COMPRESSOR unit here illustrated has given satisfactory service in haulage tunnels and drifts, according to John Fox, master mechanic, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho. It provides air for the drill used when carrying out minor tunnel or drift alterations or sideswiping work, and obviates the installation and maintenance of air take-off connections along the main air line. The unit consists of an I-R Type 40, Model 50 two-stage compressor powered by a G. E. d.c. motor through a 6-belt V-drive, and an air receiver with take-off and blow-off connections, all mounted on a four-wheel truck. Capacity is 250 c.f.m. at 100-lb. pressure, sufficient to keep one drill in continuous operation. The machinery is protected from water and rock particles by a corrugated sheet roof resting on six pipe columns, and electric current is transmitted to the motor from the trolley wire by a bronze clip mounted at the end of a wooden pole, which, when the unit is not in use, rests in the steel holders welded to the pipe columns as shown. The truck is fitted with standard couplings, and can be connected to any train entering or leaving the mine tunnel.



Cracked Cylinder Repaired With Lead Gasket

FREEZING WATER CRACKED the 8-in. cylinder of a Cameron sinking pump which was being used to dewater an old Colorado mine. As the property was inaccessible during winter months, C. C. Sanders, of Salt Lake City, resorted to an unusual but successful method of repair.

First he cut a gasket of $\frac{1}{8}$-in. sheet lead approximately 8 in. in diameter. Then the blacksmith cut a corresponding cover plate of old boiler plate and heated it so that it could be hammered to conform to the curvature of the cylinder. Twenty $\frac{1}{2}$-in. holes were drilled around the margins of the plate and gasket to match 20 tapped holes drilled to encircle the crack. The "patch" was attached to the cylinder with stud bolts. The repaired pump delivered approximately 200 g.p.m. and operated for about 30 days until the mine was dewatered.

MARKET SUMMARY

THOUGH CONSUMPTION OF major non-ferrous metals during the first quarter of the year was the largest on record, and the outlook for the second quarter remains encouraging, producers were a little uneasy as March ended over prospects for the summer months. This uncertainty was caused by the trend of developments in Europe, which clearly pointed to the collapse of Germany at an early date. Washington authorities maintain that cutbacks in the war program will be gradual, but, in the absence of definite knowledge of the government's intentions, most producers look for some contraction in business immediately after V-E day, or until production for the civilian economy can be increased. The shipbuilding program is being revised downward sharply, it was announced officially, which will reduce consumption of non-ferrous metals in that field appreciably as the year advances.

Price changes last month were confined to the minor metals. Quicksilver was available for April shipment from Spain on the basis of $152 per flask, duty paid, New York, which brought about a moderate decline in spot and nearby metal. Late in March there were sellers of spot quicksilver in New York at $160 per flask, which contrasts with $165 a month previous. The Pacific Coast market settled at $150 to $155 per flask, depending on quantity and month of shipment. Production schedules for the mercury oxide dry cell have been increased, and the trade feels that demands for the metal will be of record proportions for some time to come. In fact, observers believe that domestic production will have to be increased and substantial imports will be required to satisfy the needs. Supplies of indium are large, and competition for business has forced down the price to $4 an ounce troy. Early this year sellers were asking $7.50.

Deliveries of refined copper in February amounted to 172,585 tons, a new monthly high, which compares with 145,904 tons shipped to consumers in January. More than 100,000 tons of foreign copper were included in February's record tonnage. Domestic production of refined copper in February totaled only 69,950 tons. March statistics, available soon, are expected to show up even more favorably so far as consumption is concerned than those of the preceding month. The industry looks for domestic prices to remain unchanged after V-E day, but uncertainty exists about the price situation in foreign copper.

Supply and demand of lead were not brought into balance during March,

Major Metals

U.S. DAILY AND AVERAGE PRICES

1945 Mar.	Electrolytic Copper Domestic (a) Refinery	Electrolytic Copper Export (b) Refinery	Straits Tin New York	Lead New York	Lead St. Louis	Zinc St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
		AVERAGES FOR MONTH				
Mar.	11.775	11.700	52.000	6.50	6.35	8.25
Mar.		AVERAGES FOR WEEK				
7	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
Mar.		CALENDAR WEEK AVERAGES				
3	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1945 Mar.	Sterling Exchange "Checks" (Nominal)	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	402.000	44.750	25.500	168s.	$35.000
2	402.000	44.750	25.500	168s.	35.000
3	402.000	(e)	(e)	(e)	35.000
5	402.000	44.750	25.500	168s.	35.000
6	402.000	44.750	25.500	168s.	35.000
7	402.000	44.750	25.500	168s.	35.000
8	402.000	44.750	25.500	168s.	35.000
9	402.000	44.750	25.500	168s.	35.000
10	402.000	(e)	(e)	(e)	35.000
12	402.000	44.750	25.500	168s.	35.000
13	402.000	44.750	25.500	168s.	35.000
14	402.000	44.750	25.500	168s.	35.000
15	402.000	44.750	25.500	168s.	35.000
16	402.000	44.750	25.500	168s.	35.000
17	402.000	(e)	(e)	(e)	35.000
19	402.000	44.750	25.500	168s.	35.000
20	402.000	44.750	25.500	168s.	35.000
21	402.000	44.750	25.500	168s.	35.000
22	402.000	44.750	25.500	168s.	35.000
23	402.000	44.750	25.500	168s.	35.000
24	402.000	(e)	(e)	(e)	35.000
26	402.000	44.750	25.500	168s.	35.000
27	402.000	44.750	25.500	168s.	35.000
28	402.000	44.750	25.500	168s.	35.000
29	402.000	44.750	25.500	168s.	35.000
30	402.000	44.750	Holiday	Holiday	35.000
31	402.000	(e)	(e)	(e)	35.000
		AVERAGES FOR MONTH			
Mar.	402.000	44.750	25.500	—	35.000
Mar.		AVERAGES FOR WEEK			
7	402.000	44.750	—	—	
14	402.000	44.750	—	—	
21	402.000	44.750	—	—	
28	402.000	44.750	—	—	

Calendar week averages, New York Silver: March 3rd, 44.750; 10th, 44.750; 17th, 44.750; 24th, 44.750; 31st, 44.750.

(e) Not quoted (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout March.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

which caused the trade to be concerned over the possibility that WPB might issue another revision of the order restricting use of the metal. However, as the month closed the outlook seemed to improve, partly because of war developments.

Zinc allocation certificates appeared in the market late in March. Consumers asked for approximately 90,000 tons of April metal, but requests were cut down by WPB, particularly where Special High Grade and Prime Western grades were concerned.

More stringent tin and antimony regulations were issued during the last month. The inventory of tin, all forms, in the hands of Metals Reserve on Oct. 31, 1944, was valued at $91,989,736, at market value as of that date, the head of the RFC subsidiary stated publicly. Current imports amount to less than 75 percent of requirements, the Tin-Lead-Zinc Division of WPB disclosed.

The flow of foreign silver into the United States has steadied sufficiently to permit WPB to release additional supplies for war production.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for February and March:

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations, (e) Special shapes sold to platers.

	Feb.	March
Quicksilver, N. Y. flask	165.545	162.000
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1937	90.86
1930	82.87	1938	73.67
1931	60.20	1939	77.71
1932	48.26	1940	79.22
1933	59.79	1941	83.49
1934	69.59	1942	86.80
1935	74.66	1943	88.74
1936	73.45	1944	88.74

	1943	1944	1945
January	88.74	88.74	88.74
February	88.74	88.74	88.74
March	88.74	88.74	88.74
April	88.74	88.74	....
May	88.74	88.74	....
June	88.74	88.74	....
July	88.74	88.74	....
August	88.74	88.74	....
September	88.74	88.74	....
October	88.74	88.74	....
November	88.74	88.74	....
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated
(April 2, 1945)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb.	15c.
Antimony, domestic, spot, lb., 5 tons or more	15.839c.
Bismuth, ton lots, lb.	$1.25
Cadmium, commercial sticks, lb.	90c.
Calcium, lb., ton lots, 97@ 98 percent, cast	$1.85
Chromium, 97 per cent grade, lb.	89c.
Cobalt, 97 to 99 per cent, per lb.	$1.50
Indium, troy oz.	$4.00
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 per cent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation) troy oz.	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$160.00
Selenium, 99.5 per cent, lb.	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50 nom.
Titanium, 96 to 98 per cent, lb.	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$14.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.01
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 per cent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 60 per cent, duty paid	$24.00
Domestic, 60 per cent and upward	$24.00@$24.50
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28
(a) Prices at mines, small lots, normally several dollars less.	

METALLIC COMPOUNDS

Arsenic Oxide (arsenic) lb.	4c.
Cobalt Oxide, 70 @ 71 per cent, lb.	$1.84
Copper Sulphate, 100 lb.	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per lb. of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum, 55 @ 65 per cent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.60@8.10c.
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U.S. funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$8.50@$9.00
Missouri, 93 to 94 per cent $BaSO_4$, per short ton	$8.25@$8.50
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 60 per cent, all rail movement, ton	$30.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica — Colonial Mica Corp., agent for Metals Reserve Co., quotes full-trimmed ruby muscovite domestic, April 1 to June 30, inclusive — No. 1, $1.70 to $36.65 per lb., depending on size; No. 2, $1.25 to $26.00; No. 2 Inferior, 50c. to $16.00; No. 3, 25c. to $6.25. Prices f.o.b. nearest producer's rifting plant.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$24.50
Steel, base price, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb.	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Light-Metal Hearings Develop Conflicting Views

As expected, the hearings on the future of light metals before the Senate Special Committee on Small Business developed widely divergent testimony from the witnesses. Stated objective of the hearings was to establish a record from all segments of the light-metals industries which would assist Congress in establishing policies for the disposal of the government's huge investments in production facilities for aluminum and magnesium.

First of the producers to be heard was R. S. Reynolds, president of Reynolds Metals Co., who was assisted by Walter L. Rice, vice president and general counsel. In the prepared statement of Mr. Rice, the history of the Aluminum Co. of America was carefully traced from the start of that organization to the present. Complete details of the wartime expansion of both Alcoa and Reynolds were developed to allege that Reynolds had not received comparable treatment at the hands of the government agencies and would be at great disadvantage in postwar operations in competition with Alcoa and Aluminum Co. of Canada. It was brought out by questions of the committee that Mr. Rice went to Reynolds Metals from the Department of Justice, where he had been handling the government's anti-trust suit against Alcoa.

In his testimony, Mr. Reynolds asserted his desire to remain in the aluminum business after the war, break the monopoly previously enjoyed by Alcoa, and in so doing to aid employment. "In other words," reads the statement, "the Reynolds Metals Co. had taken all the risks when everyone said there would be no shortage, but when the shortage materialized, its competitors were favored and the value of its investment in aluminum ingot plants was thereby jeopardized."

The basis on which he would like to acquire the presently owned government plants now being operated by his company were outlined by Mr. Reynolds. "We have an option to acquire the interest of the Defense Plant Corp. in the Lister Hill mill at a price equal to the cost less the depreciation or the rent paid, whichever produces the highest price to the government. We are interested in acquiring the property, providing our power situation at Lister Hill can be worked out satisfactorily and provided we know that we are acquiring it on terms as favorable as those granted to others on the disposal of other fabricating facilities. We must have equal treatment, because the amortization expense represented by the cost of acquiring the mill is a very important item in the cost of fabricating aluminum."

Dr. Willard Dow, president of Dow Chemical Co., expressed the idea that the fabrication of magnesium is especially adaptable to smaller units of business. "We hold it as a truth that magnesium will not come into its own until ingenious individuals discover it as a metal out of which they can devise products that people will buy. . . . The way is wide open for small business to grow up with magnesium."

Forecast of the future of magnesium by Dr. Dow was based on certain assumptions. On the technical side it was on the premise that the surface has hardly been scratched and that the future will bring great advances over present knowledge. Dr. Dow's second premise was, "that we shall quickly return to a free competitive society on the American ideal with an absolute minimum of government regulation or control." Developing this point further, Dr. Dow continued, "My concern over government control is that no matter how skilled it may be or how noble its intentions, it must by its very nature delay or prevent those changes in our way of living that science brings about and which are the only changes that permanently improve the well-being of everyone. We believe that magnesium is not only a metal but also, provided human ingenuity can have full play, a great social force."

Dr. Dow significantly stated, "You have asked me to suggest a method by which the facilities provided by the Defense Plant Corp. can be disposed of to further the national interest. I take it that the national interest demands that the facilities be liquidated in such fashion as to give the greatest return to the taxpayers consistent with the long-range promotion of what is now an infant industry. It is unthinkable that the facilities be simply scrapped and sold, for the salvage would be trifling. It is equally unthinkable that the producing and fabricating facilities should be owned and run by the government. If private industry can find customers for magnesium, it could buy these facilities and run them at a profit and that would benefit everyone. The only thing that government management can do which private management cannot do is to keep on producing without customers and at the expense of the taxpayers."

Explaining that the question was primarily one for the Congress to decide, Dr. Dow made three suggestions: (1) That the producing plants be surveyed by competent technical people to determine which plants should be disposed of and which should be retained in standby condition by the government; (2) That a method be established for disposing of fabricating plants and government-owned machinery in private plants with the idea of keeping as many fabricators in business as want to stay in business; (3) That the present stockpile be held as an insurance against future emergencies rather than being thrown on the market. If the stockpile should be dumped, warned Dr. Dow, it "would kill all private production for several years and therefore it would kill all technological progress."

Disposal of government-owned plants on the basis of high employment rather than high dollar value was advocated by Henry J. Kaiser, president of Permanente Metals Corp.

Mr. Kaiser called for a clear-cut decisive policy from Congress on the disposal of all government plants, with emphasis on employment rather than money. This object could be achieved by a contract sale subject to later review, according to Mr. Kaiser.

The cost of the plants was of no interest to other magnesium producers. J. P. Margeson, Jr., vice president, International Minerals & Chemical Corp., explained that with or without government assistance his company was not interested in securing control of the DPC magnesium plant it had operated at Austin, Tex. The plant was such a high-cost producer that there was no chance for it to compete under present market conditions even if the government should give it the plant. Mr. Margeson carefully explained that his company was able to handle the purchase without government assistance, but that there was nothing to recommend the investment of some 12 million dollars in the venture.

On the question of the disposal of government-owned plants, I. W. Wilson, speaking for the Aluminum Co. of America, said that it seemed to his company that it would be unwise for Congress to establish a fixed policy until the peace treaty is made, which will forecast the military establishment this country must maintain in the future. Another reason for the postponement, according to Mr. Wilson, is the uncertainty regarding the postwar aluminum industries of the Axis countries. If they should be forbidden to produce aluminum as a means of insuring the peace, the absence of production in those countries should enlarge export possibilities for producers here. A third reason which was advanced by Mr. Wilson was that the value of plants could not be accurately set until the extent of postwar markets was known. The preservation of an integrated aluminum industry after the war was urged by Mr. Wilson, who said:

"The aluminum industry can con-

tribute most to the social welfare and economic well-being of the country when it can furnish small business enterprises with their raw material, in this case semi-fabricated aluminum, at a price that passes on to small business men the economies that result from mass production by an integrated aluminum industry."

He then warned that the industry might need protection against cartels.

Non-ferrous Metals Get Improved Draft Status

Washington officials handling mining matters were greatly encouraged by the mid-March Selective Service ruling that permitted non-ferrous metal mines to retain more than 30 percent of their essential men under 30 years of age. The WPB was authorized to request that a higher percentage of deferments over the 30 percent limit be established. In doing so, WPB was acting for copper, lead, and zinc mines, mills, and smelters and for steel and foundry workers. Coal mining, transportation, and synthetic rubber were included in the five vital war industries in which an estimated 145,000 men under 30 will be deferred. An inter-agency committee appointed by War Mobilization Director Byrnes requested the relaxation.

The new percentage of deferments fixed for the nonferrous metal mines and smelters is 67 percent. This means approximately 10,000 mine workers under 30 will not be called. There are about 15,000 men under 30 working in this industry.

Bill to Extend Premiums Passed by Senate

First of the bills to extend the premium-quota plan to pass either house was S.502, which the Senate approved on March 15. This bill provides $88,000,000 for the payments of premiums for the production of copper, lead, and zinc.

As it passed the Senate the rules now in effect would not be changed except that it prevents the cancellation of premiums by classes of mines. On this point the bill reads, "Provided further, that the premium price plan for copper, lead and zinc be extended until June 30, 1946, on the same terms as heretofore, except that all classes of premiums shall be noncancelable unless necessary to make individual adjustments of income to specific mines."

A 90-day cancellation clause that would have been operative right across all classes and by classes was dropped from the bill while it was being considered by the Senate Banking and Currency Committee.

In hearings before the House Committee on Banking and Currency on March 26, Charles P. Taft, of the Department of State, submitted a letter from Undersecretary Grew opposing the one-year guarantee. Grew maintained that this discriminated unduly against foreign producers, who are limited to a 3-month period of grace. He pointed out that the government might be forced to purchase copper at 27¢. per pound even though it might be available from foreign sources at 12¢. or less.

Committee Approves Gold Reserve Reduction

Opposition to bills pending in Congress to reduce the gold backing of Federal Reserve notes and deposits was not successful in stopping the Senate Committee on Banking and Currency from reporting them favorably substantially as introduced. The American Mining Congress joined with Western senators in opposing the measure on the grounds that it was another step toward a completely managed currency.

The bills were introduced in both houses at the request of Marriner S. Eccles, chairman of the Federal Reserve system, because the gold reserve is approaching the legal minimum. In his testimony in support of the legislation Mr. Eccles stated that a reduction in requirements to 30 percent would meet all foreseeable contingencies through 1946. It was on this point that opponents rallied, asking that the reduction be limited to 30 instead of 25 percent, also that the period of the legislation be limited to two years.

A substitute piece of legislature was introduced to raise the price of gold from $35 to $56 per ounce. Raising the price of gold would have the same effect in part as reducing the gold requirements. Mr. Eccles objected on the ground that such action would present foreign owners of gold with a neat profit.

The attempts to limit the reduction and to raise the gold price failed. However, when the committee approved the bill it made a slight concession to hard money by adding an amendment to repeal the Thomas "Greenback Amendments" of 1933. These authorized the Treasury to issue paper currency without metal backing and gave authority to issue Federal Reserve notes which required no gold backing.

Some of the views stated by Eccles in testifying on this bill are of great interest to precious-metal producers (p. 84). Because of his position, his statements must be taken as representative of Administrative policy at the highest levels.

W. Randolph Burgess, president of American Bankers Association, opposed the proposal to change the gold price, but held out for a currency backed by gold, stating, "Gold, a firm price for gold, has a social security value, because it relieves people of worry, is a guarantee of the integrity of their money. It means that the bond holder knows his money at least has something back of it that is going to hold the price so it won't become worthless. I am a hard-money person."

Personnel Announced of New USBM Stations

Assignments to the new field offices of the Bureau of Mines have been announced, and the men affected will have left for their new posts by the time this reaches its readers. The mining and metallurgical chiefs of the field divisions so far announced are as follows:

Mining	Metallurgical
College Park, Md.	
McHenry Mosier	J. B. Zadra
Raleigh, N.C.	
M. H. Kline	J. B. Zadra, (acting)
Tuscaloosa, Ala.	
J. R. Thoenen	W. H. Coghill
Rolla, Mo.	
C. H. Johnson	C. T. Anderson
Minneapolis, Minn.	
Edward Fitzhugh, Jr.	E. P. Barrett
Albany, Ore.	
S. H. Lorain	Dr. B. A. Rogers
Salt Lake City, Utah	
P. T. Allsman	S. R. Zimmerley
Tucson, Ariz.	
J. H. Hedges	Paul M. Ambrose
Boulder City, Nev.	
A. C. Johnson	C. W. Davis
Alaska	
Not set up yet.	

Bills Introduced to Clarify Stockpile Policy

In mid-March identical bills were introduced into Senate and House to clarify a postwar stockpile policy initiated in the Surplus Property Act of 1944 (*E.&M.J.*, Oct. 1944, pp. 79 and 116). The new bills propose to amend the stockpile act of 1939 to provide for accumulations as specified in recent recommendations of the Army and Navy Munitions Board (*E.&M.J.*, March, p. 107), and such future items as the Board may specify. The declared purpose of stockpiling is for military security, not economic stabilization.

The bills provide for a stockpile board, chairmanned by the Secretary of War, and including the secretaries of Commerce, Interior, Navy, and State. It provides for two classes of stockpile materials pursuant to Board recommendations published in our last issue. "Group A" covers materials for which stockpiling is considered the only satisfactory means of providing an adequate emergency supply. The amounts specified by the Board have not been made public but are known to be large. "Group B" materials are recommended only in the amounts available by transfer from other government agencies.

The bills would continue the "buy American" provision of the 1939 act, which was opposed by the Board and the State and Interior departments. The bills provide that materials must be held for use only in a future war emergency declared by act of Congress. Otherwise, they can be released only for rotation, because of technical obsolescence, or by specific authorization of Congress.

NEWS OF THE INDUSTRY

Mining Men Liberated In the Philippines

From official War Department lists of civilian personnel liberated in the Philippines, *Engineering and Mining Journal* has culled the following names of pre-Pearl Harbor *E.&M.J.* subscribers and of members of the A.I.M.E. as recorded in the 1943 directory. Others of the same surname and emergency address are included. The list below contains names in releases Nos. 1 to 21 inclusive, issued by the War Department up to and including March 3, 1945. Names from subsequent War Department lists will be published later. No indication is given of the present whereabouts of these people, but emergency addresses in the United States can be obtained from the Editor of *E.&M.J.*

Alexander, John C., Josephine R.
Bacon, Frank O.
Bedford, Earl Walter
Blessing, Lee Rudolph
Blinzler, Lee Edward, Virginia, Lee Ann
Boericke, William Fay
Bradfield, Charles Burton
Brussolo, Vito A., Charles W., Charlotte Edna, John
Cadwallader, Brooke D., Mary D.
Canon, Roscoe H., Bruce B., Louise, Marie L., Roscoe H. Jr.
Clark, Vivian Verdier
Claunch, Floyd E.
Condy, Thomas P.
Conrad, Ralph Moritz
Crawford, Paul R., Catherine L., Pauline S., Donald L.
DeVore, Thomas A., Tania
Dungey, Arthur
Elliott, Cecil L., Ann, Hazel A.
Elsley, Byron, Corinne
Engel, R.
Faneuf, Samuel Centennial
Flanagan, Joseph Myron, Harriet E.
Gardner, Dian Lowell
Hamm, Mr. and Mrs. Ward F.
Hansen, Mayer G.
Harrison, Joel B., Ernestine
Holdsworth, P. R.
Jarrett, Stanley Morgan
Lawson, Theodore J., Janette C., Ruth L.
Lennox, Luther W.
Light, Victor Allen
Lile, Richard L., Marquita H.
McLoughlin, Ralph H.
Mills, Malcolm D., Elizabeth A., Mark B.
Mitke, Mr. and Mrs. Charles A.
Morrison, Harry C.
Moule, William R., Eileen
Neal, Walter, Dora Ethel
Peterson, Paul R.
Renning, John A.
Robinson, Lewis M., Ola, Geraldine, Patsy, Lou, Lewis C.
Schafer, Paul A.
Scotty, Joe
Shuman, Omar M.
Smeddle, John, Virginia I., Virginia W.
Smith, C. R.
Smith, Lawrence E., Rochelle L., Roxanne L., Marie D.
Solomon, Weaver A., Katherine E., Katherine Elaine
Spencer, Richard N., Beverly L.
Stapler, James B., Josephine H.
Stone, N. C.
Strachan, Gordon Douglas, Sr. and Jr., Helen L.
Sundeen, Mr. and Mrs. Ludwig J.
Weekley, Clarence A.
Wichman, Arthur H., Gladys, Douglas, Daniel

Annual Reports List 1944 Metal Production

American Metal Company, Ltd. Production of the company's smelters and refineries, consisting of products treated on toll for account of others, products of purchased materials and products of owned, partly owned, and leased mines:

	1944
Copper, tons	178,526
Lead, tons	61,421
Zinc, tons	84,218
Non-ferrous alloys, tons	35,294
Metal powders, tons	4,704
Aluminum, tons	4,651
Solder, tons	2,998
Silver, oz	64,457,999
Gold, oz	585,357
Platinum, oz	2,167
Palladium, oz	2,375
Selenium products, lb	216,054
Zinc dust, tons	3,499
Sulphuric acid, tons	106,568

Phelps Dodge Corp. Production from the Corporation's mines, including production under contracts with Metals Reserve Co., together with metals produced from purchased ores treated at the Arizona smelters:

	1944	1943
Copper, lb	458,153,723	478,319,109
Silver, oz	3,209,125	4,024,347
Gold, oz	89,979	123,870
Lead, lb.*	7,208,369	1,127,006
Zinc, lb.*	21,674,463	5,770,002

* The ores from which the above production was obtained were shipped to, and treated by, customs mills and smelters.

American Smelting & Refining Co. and Subsidiaries Consolidated. Production of refineries (excluding alloys, by-products, and fabricated products) from products treated on toll for account of others, products of purchased materials, and products of owned, partly owned, or leased mines; tons of charge smelted, and tons of ore mined:

	1944	1943
Gold, oz	1,130,448	1,337,928
Silver, oz	81,120,738*	67,643,787
Lead, tons	462,002	478,921
Copper, tons	488,359	547,015
Zinc, tons	118,103	123,672
Tons charge smelted	4,427,846	4,923,359
Tons ore mined	2,449,285	2,682,568

* Includes 22,537,646 oz. of silver scrap.

Kennecott Copper Corp. Ore mine at the properties of the corporation totaled 51,022,995 tons. Production was as follows:

	1944	1943
Copper, lb	1,161,589,341	1,274,377,957
Molybdenite, lb	25,071,285	24,572,252
Gold, oz	313,386	344,357
Silver, oz	2,693,558	3,059,286

A total of 82,392,067 tons of material was mined at the four properties in Utah, Nevada, Arizona, and New Mexico. Of this total 40,865,036 tons was overburden and 41,527,031 tons was ore averaging 1.005 percent copper. Ore mined and milled at Braden Copper Co., the Chilean Division, totaled 9,495,964 tons averaging 2.269 percent copper.

International Nickel Co. of Canada, Ltd. Sales for the year 1944 are reported as follows:

Nickel, lb.*	250,212,561
Nickel, lb.**	285,238,333
Copper, lb.*	269,006,131
Copper, lb.**	314,684,817
Gold, oz	61,838
Silver, oz	1,784,633
Selenium, lb	85,519
Tellurium, lb	7,087
Mill and foundry products, lb	80,549,514

* Derived from company's own mines.
** Sales including metal refined for others.

Simplified Mining Forms Adopted by SEC

A simplified form, S-11, for the registration of shares of mining corporations in the exploratory stage has been adopted by the Securities and Exchange Commission, according to an announcement on March 23. The commission also made public a new rule, 240, under Section 3(B) of the Securities Act of 1933, which exempts from registration assessable shares of mining corporations up to $100,000 a year.

Under the new rule, a prospectus must be supplied by the corporation offering assessable shares, and a statement of prescribed information must accompany each assessment notice. The new rule was adopted on a trial basis, and will be modified or rescinded if it proves harmful to the public interest.

Form S-11 will be used by companies which "have no mining property developed beyond the exploratory stage," are not actively engaged in ore production, "have not been involved in recent successions, and are without important subsidiaries."

Copies of the new form, and a booklet designated as "Supplement to Form S-11 Under the Securities Act of 1933," may be obtained from the Publications Unit, Securities and Exchange Commission, Philadelphia 3, Pa. It is expected that they will be available by April 7, 1945. The booklet will aid in preparing registration statements.

MRC President Reveals Value of Premiums

Speaking before a joint meeting of the A.I.M.E. and the Mining and Metallurgical Society of America on March 21, Charles B. Henderson stated that up to Feb. 28, 1945, the value of vital strategic metals and minerals purchased by MRC totaled $2,200,000,000, of which $1,500,000,000 was sold. Premiums paid on metals up to that date totaled $61,000,000 for copper, $28,000,000 for lead, and $84,000,000 for zinc. Material remaining in stockpiles was valued at approximately $530,000,000.

Appeals Court Rules Alcoa Operated Monopoly

A three-man Circuit Court of Appeals empowered to sit as a panel of the Supreme Court by special legislation, ruled on March 12 that the Aluminum Company of America and Aluminium, Ltd., a Canadian corporation organized by Alcoa, operated a monopoly in violation of the Sherman Anti-Trust Act. This action reverses a verdict

rendered in 1941 by the United States District Court, which was subsequently appealed by the Department of Justice.

It was also ruled that Aluminium, Ltd., had sought to restrict American commerce in violation of Section I of the Sherman act by entering into cartel agreements with foreign countries.

Although the appellate court adjudged Alcoa to be a monopoly, it did not sustain the contention of the Department of Justice that the company be broken up. The case was returned to the lower court for decision regarding the dissolution and further proceedings. Justice Learned Hand of the Circuit Court wrote:

"It is as idle for the plaintiff (government) to assume that dissolution will be proper as it is for Alcoa to assume that it will not. And it would be particularly fatuous to prepare a plan now, even if we could be sure that eventually some form of dissolution would be proper. Dissolution is not a penalty but a remedy; if the industry will not need it for protection, it will be a disservice to break up an aggregation which had for so long demonstrated its efficiency."

Alcoa contended that although it alone had produced virgin aluminum until recently, it had been obliged to meet competition from secondary or reclaimed aluminum. This contention was overruled by the court on the grounds that the control of new production was a strong means of regulating the source of secondary production.

Expressing satisfaction with the appellate decision, which followed eight years of litigation, Arthur V. Davis, chairman of Alcoa, and Roy A. Hunt, president, have issued this statement:

"The Circuit Court of Appeals ruled that Alcoa monopolized the virgin ingot market as late as 1940, when it was sole domestic producer. Since then the situation has completely changed by the entry of other producers into the ingot market and by the construction for and ownership by the government of ingot-producing plants with a capacity more than 50 percent greater than Alcoa's. This the court recognized. It was neither held nor intimated that the company had a monopoly under these circumstances. The court stated that it by no means followed that because Alcoa had a monopoly in 1940 it would have one when final judgment is entered after the war."

Senate Passes Bill Raising SEC Exemptions

The Senate passed a bill on March 15 authorizing the Securities and Exchange Commission to exempt issues of securities not exceeding $300,000 from registration and from civil liabilities imposed by Section 11 of the Securities Exchange Act. Senator Arthur Vandenberg, of Michigan, introduced the amendment as a rider tacked on to a measure passed by the Senate and sent to the House, increasing by $100,000 the authorization for Federal Housing Administration insurance on privately financed war housing.

Senator Vandenberg stated that the present law requiring SEC approval on all issues above $100,000 makes it "almost impossible to float small issues of stocks and bonds," and added that the increase was necessary to encourage small business refinancing after the war.

Premiums Not Subject to State Metal Mines Tax

The Montana Supreme Court ruled on Feb. 26 that premiums paid by the Metals Reserve Co. for metals produced in the State are not subject to State metal mines taxation because they are an inducement and not a part of the value of the product.

The unanimous opinion of the Supreme Court affirmed judgment of the Cascade County District Court, which upheld plaintiffs of Great Falls who brought action against the county treasurer, maintaining that a county tax of $1,756.79 which was levied on premiums totaling $35,546.48 for open market sales of gold, silver, lead, and zinc, was not proper.

In stating its opinion, the Supreme Court pointed out that:

1. The Constitution of Montana provides for a tax on the "annual net proceeds of all mines and mining claims" which are determined by deducting allowable costs from the gross value of the product.

2. Gross value is defined as "the money which the producer received or should have rightly received upon the bona fide sale of his product."

3. Premiums and bonuses paid by the government are not a part of the purchase price for the product, but are an inducement for its production.

A similar decision was made in Utah on Oct. 30, 1944, when Federal District Judge Tillman D. Johnson ruled that the State Tax Commissioner was in error in construing federal premium payments on over-quota production as subject to the Utah mine tax.

Birmingham Will Receive Texas Iron Ore

The Lone Star Steel Co. has contracted to supply 100,000 tons of East Texas iron ore to the Republic Steel Co.'s plant at Birmingham, Ala., John W. Carpenter, president of the Texas concern, announced recently. This will be the first competition between Texas and Alabama ores, and if the Texas ore works out satisfactorily, it is considered likely that additional contracts will be made.

The ore will be treated in the Lone Star Steel Co.'s beneficiation plant at Daingerfield, Morris County, Texas. It was announced that East Texas ore runs about 60 percent iron. Other plants using the East Texas ore include Sheffield Steel at Houston and Koppers United Co. at St. Louis.

Korea Mineral Industry Will Need Engineers

After the Japanese have been driven from Korea, a large number of mining engineers and metallurgists will be needed to assist in the rehabilitation of numerous mineral industries, according to an announcement by the Provisional Government of the Republic of Korea, which is headed by Dr. Syngman Rhee, president. Samuel H. Dolbear, 11 Broadway, New York City, has been appointed Mineral Adviser to Korea, and wishes to contact engineers who have had previous experience in Korea to assist in formulating a program, and later in actual operations.

Mineral production in Korea includes gold, silver, coal, iron ore (pig iron and steel), salt, portland cement, clay and clay products, graphite, copper, lead, zinc, tungsten, magnesite, aluminum, barite, fluorspar, mercury, and molybdenum. According to Japanese statistics, the industries employ about 220,000 men.

A joint declaration of the United States, Great Britain, and China has assured Korea of her ultimate independence.

Three to Bid For Geneva Steel Works

The Colorado Fuel & Iron Corp., of Denver, informed the Defense Plant Corp. early in March that it was interested in acquiring the $200,000,000 Geneva Steel Works at Provo, Utah, now operated for the U.S. Government by a subsidiary of the United States Steel Corp.

Similar intentions to bid for the Geneva plant were announced in February by U.S. Steel and the Kaiser Co., Inc., which operates the $100,000,000 steel project at Fontana, Calif.

Economic Geologists Elect Society Officers

The Annual Technical Sessions of the Society of Economic Geologists which were scheduled for Feb. 19–22 were cancelled in compliance with government request. However, the annual business meeting of the society and the meeting of its council were held on Feb. 20 in New York City. After the dinner at the Harvard Club, attended by 45 members and guests, the election of the following officers was announced: W. O. Hotchkiss, president elect (1946); J. Terry Duce, vice president elect (1946); George M. Fowler, F. M. Cameron, and T. G. Moore, councilors (1945–47). Regional vice presidents for 1945 are: Alfred Brammall, Europe; J. M. S. Krishnan, Asia; R. A. Pelletier, Africa; George Hanson, North America; O. H. Leonardos, South America; and R. Lockhart Jack, Australia.

Other officers for 1945 are: O. E. Meinzer, president; T. B. Nolan, first vice president; J. T. Singewald, Jr., treasurer; C. H. Behre, Jr., secretary.

Civil Service Commission Seeks Metallurgists

The Civil Service Commission has announced that metallurgists are needed to fill positions in the Bureau of Mines, in Naval Shore Establishments, and in War Department Arsenals. The salaries, including overtime pay, range from $2,433 to $6,228 a year. Interested persons may secure announcements containing full information regarding the positions, and application forms, at the nearest first- or second-class post office or direct from the U. S. Civil Service Commission, Washington 25, D.C.

A.S.&R. Abandons Brazil Nickel Operations

After having solved a difficult metallurgical problem in recovering nickel from its Brazilian property, Companhia Niquel Tocantins, the American Smelting & Refining Co. stated in its 1944 annual report that the process, as applied to actual Brazilian conditions, would not permit a profit. Consequently the company abandoned the project, surrendered its shares for the benefit of the Brazilian stockholders, and wrote off the project at a loss of $2,663,925.

In explanation, the report stated "The mine has a large body of ore containing nickel in an amount that, using our process, would in more favorable localities yield a suitable profit. But the pioneer conditions due to geographical remoteness of the mine, the scarcity of labor, which would have to be imported from distant localities, and the excessive cost of power, fuel, and freight, were factors whose combined effect, as finally proven, could not be successfully overcome."

Internal Corrosion Causes Hoisting Rope Failure

Undetected internal corrosion of rope strands caused the rope failure which resulted in the death of 16 miners at the Paymaster Consolidated Mines, Ltd., Timmins, Ont., early in February. The cable broke near the hoist drum while the cage was near the 1,000-ft. level of the 2,500-ft. shaft. Safety dogs on the cage failed to arrest the fall.

The rope was a 1-in., 6 x 7, flattened strand type and had been in service for approximately 30 months, operating under a factor of safety of 6.7 when loaded to capacity. At the time of the accident, the load was only 60 percent of the maximum load normally carried when hoisting ore from the lowest shaft pocket. Breaking tests performed on the rope after the accident by the Wire Rope Laboratory of the Ontario Bureau of Mines demonstrated a reduction of 61 percent in ultimate strength in the vicinity of the point of failure. The external portion of the rope was well lubricated and did not indicate the internal corrosion of the strands. A coroner's jury decided that the accident was not due to carelessness or neglect.

ECPD Plans Engineering Guidance for Veterans

Vocational guidance aid to returning veterans who may look to engineering as a peacetime career is one of the major activities of the Engineers' Council for Professional Development, as outlined in the twelfth annual report for the year ended Sept. 30, 1944. "To serve these veterans adequately will require all the facilities at our command," says the report. Because veterans are gravitating naturally to facilities in their own localities, informational material on engineering education should be made available to high school principals and guidance officers. The fact that there are 25,000 high schools in the United States gives an idea of the scope of the problem.

Other matters dealt with in the report are: (1) The development of a battery of tests to aid in the selection of students for engineering; (2) the accrediting of engineering curricula, which has been held to a minimum on account of abnormal wartime conditions; and (3) formulation of a plan to accredit the educational programs of technical institutes. The list of accredited undergraduate engineering curricula is published in full, by institutions and by curricula. Copies of the report are available on application to the secretary of ECPD, 29 West 39th St., New York 18, N.Y., or to the Engineering Institute of Canada, 2050 Mansfield St., Montreal 2, Canada.

NEWS BRIEFS

First Time in 66 Years. Last year was the first full year since production began in 1878 in which no ore was mined or milled at the Homestake mine, Lead, S.D., according to an annual report submitted by Guy N. Bjorge, general manager. A net loss of $1,148,220 for 1944 was reported for the operations of the Homestake Mining Co. and wholly owned subsidiaries, which include the Wyodak Coal & Mfg. Co. and the Golden Gate Mine & Timber Co. This is in contrast to a profit of $346,437 for 1943. Reserves of developed ore were reported as 19,005,835 tons, including 91,685 tons of broken ore in shrinkage stopes.

Venezuela to Ship Iron Ore to U.S. As soon as operations get under way, the Iron Mines Co., a subsidiary of Bethlehem Steel Corp., will ship 2,000,000 tons of iron ore from large high-grade deposits near San Felix, on the Orinoco River, according to a recent statement by M. L. Jacobs, president of the company. The ore will be shipped 30 miles by railroad to the river loading dock and thence by shallow-draft boat to Gasparillo Island, between the mouth of the Orinoco and Trinidad, where it will be transferred to 15,000-ton ocean-going ships.

Nitrate Workers Strike. More than 4,500 workers at three nitrate plants in Iquique, Chile, declared a strike on March 8 after their requests for wage increases had been rejected.

Utah Fellowships. The Department of Mining and Metallurgical Research at the University of Utah, Salt Lake City, is offering several research fellowships for the year beginning September, 1945, each carrying a stipend of $600. The fellowships lead to a Master's degree, and are open to college graduates with proper background in mathematics, physics, and chemistry. Further information may be obtained from the head of the research department.

New Syenite Deposit. A nepheline syenite deposit, believed to be the only known one in the United States, has been discovered near Wausau, Wis., according to Ernest F. Bean, State Geologist, who reports that the only other known deposit in North America is in Ontario, Canada. Nepheline syenite is imported for use in the glass and pottery industries, and has been investigated as a source for alumina by the Canadian Bureau of Mines.

Reminder to Claim Holders. Because assessment work on unpatented mining claims has been suspended for the duration, owners must file a "Notice of Intention to Hold" with the county recorder before noon on July 1 of each year.

R.F.C. Subsidies. The Senate passed a bill on March 15 authorizing payment of $1,468,000,000 in government subsidies for food, metals, and rubber until June 30, 1946. Of this total requested by the Reconstruction Finance Corp., $88,000,000 was specified for copper and other minerals.

Missouri Fellowships. Graduate Fellowships of the Mining Experiment Station are open for the academic year 1945–46 at Missouri School of Mines and Metallurgy, Rolla, Mo. Advance work and research leading to Master's and PhD degrees may be taken in mining (including mining geology and petroleum options), ceramics, metallurgy, or geology. Applicants should address inquiries to Dean Curtis L. Wilson.

Bauxite on Japanese Islands. The Navy disclosed recently that valuable deposits of bauxite have been discovered in some of the Japanese mandated islands. The islands are not yet in our hands, and the extent of the deposits is unknown. The main deposits are on Babelthaup and Yap, in the Palaus, and on Kusaie and Ponape, in the Carolinas. The source of the information was not disclosed by the Navy.

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PERSONAL NEWS

Philip D. Wilson, WPB vice-chairman for metals and minerals, has been made a special assistant to **J. A. Krug,** chairman. Mr. Wilson is succeeded by **William C. Keeley,** who comes to WPB from Air Reduction Co., Inc. Mr. Keeley is a vice-president of that company.

Kenneth L. Cochran, geologist for the Baroid Sales Division of the National Lead Co. at Malvern, Ark., has left on a two months' trip to California to do some work for the company on the West Coast.

Lute J. Parkinson has been appointed general superintendent of the Braden Copper Co., operating in Chile. He may be addressed at Casilla 322, Sewell, Rancagua, Chile.

George C. Heikes, director of the Aluminum and Magnesium Division of WPB, resigned on March 21. He is now employed with Ventures, Ltd. His office will be at 917 Fifteenth St., N.W., Washington, D.C. **Nigel H. Bell,** of New York City, has been appointed director of the Aluminum and Magnesium Division, succeeding Mr. Heikes. Mr. Bell was formerly chief of the Fabrications Branch of the Aluminum and Magnesium Division. He has been with WPB since 1942.

Sam McNeil has been appointed general manager of Cochenour-Willans Gold Mines, Ltd., operating in the Red Lake region north of Kenora, Ont. He was recently assistant manager of McKenzie Red Lake Gold Mines.

Northwest Mining Association has elected the following officers, all of Spokane: Left to right, Charles P. Robbins, retired, former operator in the Republic district, treasurer; Charles E. Marr, president of Sheep Creek Gold Mines Co., of British Columbia, and a director in Spokane-Idaho Mining Co., of the Coeur d'Alenes, president of the Association; and W. Randolph Green, in the Spokane office in the United States Bureau of Mines, secretary.

Einar Larum, well-known prospector of the Lardeau district, is returning to Great Bear Lake, N.W.T., to prospect for Eldorado Mining & Refining, Ltd., for his second consecutive year.

F. C. Tomlinson has gone to British Guiana to join the engineering staff of Cuyuni Goldfields, Ltd.

Ernest R. Rodriguez has joined the staff of Magma Copper Co., Superior, Ariz. He was until recently chief mine engineer for Basic Refractories, Inc., at Gabbs, Nev. He may be reached by addressing Box 601, Superior, Ariz.

Arnold A. Gustafson has been appointed resident manager of the Freeport Exploration Co. at Toronto. Recently he has been mining engineer with Freeport Sulphur Co. in Cuba and in the company's New York office.

E. J. Kenny, senior geological surveyor with the Department of Mines, New South Wales, has been appointed assistant under secretary for mines in that State.

R. G. Collins, who was previously manager of the Broken Hill Proprietary Co., Ltd's., Hannan's North mine, at Kalgoorlie, Western Australia, has been appointed general manager of the company's iron-ore mine at Yampi Sound, in that State.

W. B. Blair, recently discharged from the R.C.A.F., is reentering the exploration field in British Columbia. Prior to enlistment he was on the staff of the Cariboo Gold Quartz Mining Co., Ltd.

Dr. Zay Jeffries, of the General Electric Co., Pittsfield, Mass., was awarded the recently established annual powder metallurgy medal of Stevens Institute of Technology on March 7, when he delivered the lecture sponsored by the Powder Metallurgy Laboratory of the College.

James Bacon, formerly head of the Non-metallic Section of the Mining Division of the War Production Board, left his position early in February to open his own office in Washington. He will specialize in consultation involving beneficiation, separation, and procedure problems

William F. McCandlish, representative of Hercules Powder Co. in the Philippines, who was interned in Los Banos prison camp by the Japanese in 1942, is among Americans recently liberated by the U. S. Army.

Ralph M. Ferry, formerly manager of the New Kensington, Pa., works of the Aluminum Co. of America, has been appointed manager of Tennessee operations of the company.

Walter Stalder, consulting petroleum geologist, has been elected chairman of the San Francisco Section A.I.M.E. **W. Spencer Reid** is vice chairman, and **William Wallace Mein, Jr.,** secretary-treasurer. Members of the executive committee include **Walter Stalder, Mr. Reid, Mr. Mein, Charles A. Dobbel, J. D. MacKenzie, L. B. Wright,** and **John B. Huttl.**

Dr. J. R. Van Pelt, Jr., until recently technical director of the Museum of Science and Industry, in Chicago, has joined the staff of Battelle Memorial Institute at Columbus, Ohio. Dr. Van Pelt is a geologist, an educator, a scientist and an author, and a pioneer in educational research and development. He is a life member of the A.I.M.E., was chairman of the Chicago section in 1933, a national director in 1940–1943, and national vice president in the term extending from 1944 to 1947.

Chas. F. Jackson announces that a portion of his time will be available for limited engagements after April 1. Until further notice, address Suite 2824, Graybar Building, 420 Lexington Ave., New York 17, N.Y.

R. D. Mallison, who has been in Peru with Cerro de Pasco Copper Co. for the past three years, is now a member of the staff of Newmont Mining Corp.

William F. Netzeband, engineer and geologist of Joplin, Mo., is directing diamond drilling operations in the central mining district of Grant County, N.M., for the American Zinc, Lead & Smelting Co. His headquarters are at Silver City, N.M.

R. J. Linney has been appointed district manager of the Port Henry District of the Republic Steel Corp. in northern New York, and **W. J. Linney** has been

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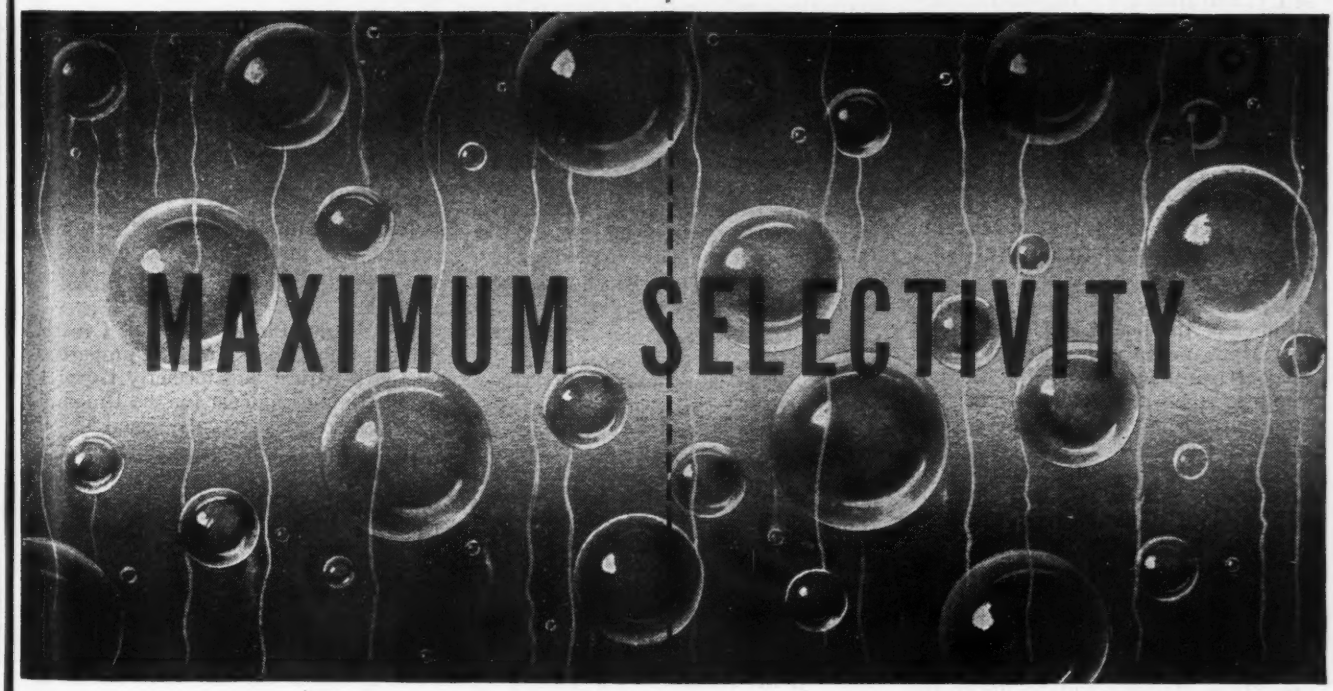

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similarly appointed district manager of the Chateaugay District of the company, also in northern New York, according to **C. M. White,** vice president in charge of operations. These appointments follow the resignation of **J. R. Linney,** who has been district manager of Republic's northern New York mining operations and who has resigned to enter the mining consulting field. R. J. Linney was formerly general superintendent at Port Henry and W. J. Linney general superintendent at Chateaugay.

Arthur M. Miller, who had been with the Tennessee Valley Authority, originally as works manager of the chemical plants at Muscle Shoals and since 1938 as director of the T.V.A. department of chemical engineering, has been appointed assistant to the president of the Rohm & Haas Co., of Philadelphia. Mr. Miller is a graduate of M.I.T. and Harvard. He was formerly associated with Tennessee Eastman Corp., and General Chemical Co., of New York.

E. Newton Roberts has left the United States for Chile to become assistant superintendent in the oxide division of Andes Copper Mining Co.

Herbert Hoover was guest of honor at a dinner of the Men's League of Marble Collegiate Church in New York on March 13 last.

M. B. Gentry has been elected a member of the board of Cuban-American Manganese Corp., a subsidiary of Freeport Sulphur Co. Mr. Gentry, who also is a vice president of the two companies, is a mining engineer who has been active in mining enterprises in both North and South America. He became a member of the Freeport organization in 1935 as assistant to the president.

Howard Hendricks, superintendent of the Shattuck Denn mill, in the Warren mining district of Arizona, has recently been promoted to chief metallurgist. All Shattuck Denn milling projects in Arizona will be under the jurisdiction of his metallurgical staff. He has been continuously connected with Shattuck Denn Mining Corp. since 1916.

Phil A. Allen has accepted a position with Eagle-Picher Mining & Smelting Co. in Sahuarita, Ariz. Mr. Allen was formerly assistant chief engineer of Shattuck Denn Mining Corp., of Bisbee.

C. M. Farnham, representing the Falconbridge Nickel Co., recently spent several weeks in Venezuela investigating mineral deposits and collecting information relative to the mining industry.

Francis Cameron, of the Foreign Exploration Department of Anaconda Copper Mining Co., paid a visit to Venezuela in January and February to collect information on mineral deposits, particularly copper, nickel, and gold.

Manning W. Cox has discontinued work in the Foothills District of California to join **S. G. Lasky** in the study of the Grant County area of New Mexico. He has spent about a year and a half studying the copper deposits of the first-named district and expects to be at Silver City for some time.

Dr. Edward L. Clark, Missouri state geologist, has been reappointed by **Governor Phil M. Donnelly** to head the state's geological survey and water resources bureau to fill the unexpired term of the late Dr. H. A. Buehler, of Rolla. The reappointment is a recess one for the unfinished four-year term of Dr. Buehler, which will expire in August of this year.

Robert H. Boehmer, formerly general mill foreman for International Nickel Co. at Copper Cliff, Ont., has been retired and is now at Hot Springs, N.M.

Nejad Oklar, mining engineer of Istanbul, Turkey, graduate and post-graduate in mining at the University of Pittsburgh, has been appointed mining engineer of the lignite mine in Degirmisaz, Turkey.

Paul A. Bundy, mining engineer, who went to Lima, Peru, in April 1943 for the Foreign Economic Administration, in charge of equipment and supplies for procuring strategic metals and minerals in Peru, was promoted in July 1944 to the position of field chief in charge of all South American mine equipment and supply procurement activities.

E. Miles Flynn, mining engineer for South American Gold Areas, Ltd., a Canadian company operating in Minas Geraes, Brazil, has returned to that country after a two months' stay in Canada and the United States. On his way to Brazil he expected to examine mining properties in British and Dutch Guiana.

Robert L. Loofbourow, formerly with Howe Sound Mining Co., has recently joined the staff of E. J. Longyear Co. Mr. Loofbourow is a graduate of Stanford University and will assume duties under **J. M. Riddell** in the company's mining division.

A. T. Ullman, chief chemist with the Broken Hill Proprietary Co., Ltd., at the company's Newcastle steel works for 22 years, has retired after 30 years' service with the company.

David D. Baker, mining engineer for Union Carbide Co., returned recently from London to company headquarters in New York City.

Dr. Victor Lopez, Director of Mines and Geological Survey in Venezuela, and **Sra. de Lopez,** recently arrived in the United States on the Venezuela Clipper of Pan American World Airways. Dr. Lopez is performing a special mission for his government in Washington and will return to Venezuela in April. He recently addressed the faculty and students of the department of geology at Columbia University and officials from mining and petroleum companies with headquarters in New York City. Dr. Lopez described and illustrated particularly those geological features which apply to phases of mineral production other than petroleum.

OBITUARIES

A. F. Duggleby, of Colorado and California, vice president and general manager of the Benguet and the Balatoc gold mining companies, operating at Baguio, in the Philippines, who was a prisoner at Santo Tomas camp, was killed by Japanese just prior to the arrival of American forces, together with a group of fellow Americans.

James Dickson, 64, secretary and treasurer of Anaconda Copper Mining Co. since 1940, died in Garden City, Long Island, on March 20.

Roland M. Gruss, former operator of the Gruss mine, at Genessee, Calif., died in Greenville, Calif., on Feb. 18, aged 57.

Walter J. Bracking, at one time president of Premier Mines Corp. of Nevada, died recently at Millbrae, Calif., at the age of 77.

Robert Pickett Carr, 49, a mining engineer employed for years in Central and South America, died recently in Lima, Peru.

John William Jacobsen, retired mining engineer and formerly an executive of Johns-Manville Corp., died on March 10 in New York at the age of 70.

Dr. Hans Pirow, of the Central Mining-Rand Mines group of properties in South Africa, and formerly Government Mining Engineer for the Union of South Africa, died recently, aged 52.

Howard Melville Hanna, chairman of the board of the M. A. Hanna Co., mining and shipping concern, died in Cleveland, Ohio, on March 17 at the age of 67.

Flying Officer James Roy Alexander Maconachie, R.C.A.F., has been reported killed in action while serving with the Mosquito Squadron, R. A. F. Prior to enlistment in 1942 he had been Resident Mining Engineer for the British Columbia Department of Mines.

Harold Kingsmill, 71, former president of Cerro de Pasco Copper Corp., of Lima, Peru, died at Greenwich, Conn., on March 25. He had supervised the property in Lima for 28 years.

Professor Emeritus Robert Hallowell Richards, distinguished metallurgist and oldest living graduate of the Massachusetts Institute of Technology and Phillips Exeter Academy, died in South Natick, Mass., on March 27. He was 100 years old. An appreciation will appear in an early issue.

Dr. Leland Russell van Wert, consulting metallurgist, died in Philadelphia on March 26 at the age of 55.

Frank V. Zichosch died at Baker, Ore., on Feb. 1. Born in Alsace-Lorraine, France, he had been employed in engagements which took him from African jungle to the Siberian Arctic. When 60 years old, he became interested

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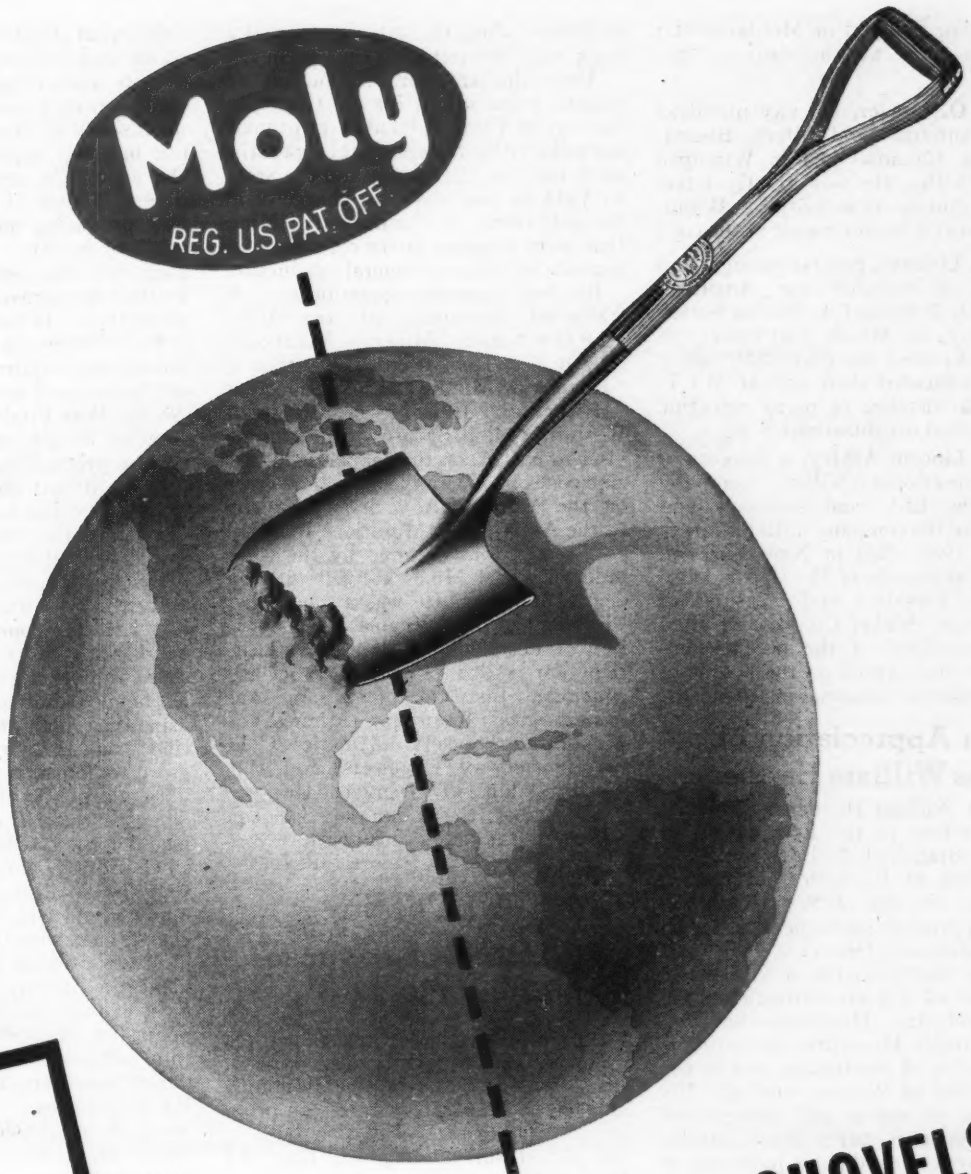

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in searching for gold in Montana, and made his home at Sheridan, in that State.

Frank O. Fowler, 83, vice president of San Antonio Gold Mines, Bissett, Manitoba, Canada, died in Winnipeg on Feb. 17th. He was greatly interested in community activities in Winnipeg, and was a former mayor of the city.

Karl A. Lindner, general manager and director of research for American Smelting & Refining Co., died at Scotch Plains, N.J., on March 3, at the age of 53. Mr. Lindner was born in Germany and was educated there and at M.I.T. He was a member of many scientific and technical organizations.

James Lincoln Ashley, a director of the International Nickel Company of Canada, Ltd., and secretary and treasurer of the company until his retirement in 1939, died in New York on March 6, at the age of 75. He had also been vice president and treasurer of International Nickel Co., Inc., United States subsidiary of the parent company, and had served on the boards of many prominent financial institutions.

An Appreciation of Charles William Henderson

Charles William Henderson, chief of Western offices of the Economics and Statistics Branch of the U. S. Bureau of Mines, died at Rochester, Minn., on Jan. 26 at the age of 59. Death followed an operation subsequent to several weeks of illness at Denver.

Known affectionately as "Scotty" to a host of friends throughout the mining industry, Henderson had devoted virtually his entire career to the Denver office of the Bureau and to the advancement of Western mining. His knowledge of values and reserves of mining properties, particularly in Colorado, was encyclopedic; his judgment of their potentialities was uncanny. Being naturally a partisan, he made the West a cause; it became the center of his existence.

Henderson was born at Valley City, N.D., in 1885. He studied mining and geology at Stanford University, receiving his B.A. degree in 1910. Even before graduation, in 1907, he was associated with the San Francisco office of the U. S. Geological Survey, which then collected the federal government's mineral statistics. In 1908, Henderson went to Butte, where he worked underground. However, after a few months he took charge of statistical work in the Denver office of the Survey.

At Denver, "Scotty" drove himself tirelessly to improve records and methods. He read incessantly. Always an advocate of learning about mines at first hand, he seized every opportunity to visit the properties in his territory, get acquainted with the operators, and exchange information. By such diligence and methods he not only built up an impressive personal knowledge of the mines and operators of the region, but set new standards of performance for the office. In 1924 Henderson moved to the U. S. Bureau of Mines when the mineral statistical work was transferred to that agency.

After the transfer, Henderson remained a consultant for the Geological Survey, and was influential in promoting and guiding the excellent cooperative work between the Survey and the State. In 1935 he was placed in charge of all the field offices of the Bureau of Mines that were engaged in the collection and analysis of data on mineral production.

Besides numerous contributions to "Mineral Resources of the U.S." (U.S.G.S.) and "Minerals Yearbook" (U.S.B.M.), Henderson was author of "History of Mining in Colorado," and "History and Influence of Mining on Western United States." He was adviser to N.R.A. on the copper, lead, and zinc codes in 1933 and 1934, and served on the Minerals Advisory Committee to the Army-Navy Munitions Board.

"Scotty" was honored by the Colorado School of Mines in 1930 with the degree of D.Sc. He was a member of Phi Gamma Delta, Sigma Xi, Association of Petroleum Geologists, Association for Advancement of Science, American Institute of Mining and Metallurgical Engineers, Mining and Metallurgical Society of America, Colorado Society of Engineers, and University Club of Denver. He was president of the Colorado Scientific Society at the time of his death.

EVAN JUST

A LETTER

Quicksilver Grievances

The Editor:

The quicksilver industry of the United States has been the guinea pig which gives a preview of the type of consideration that the metal mining industry in the United States can probably expect from Washington both in the period surrounding VE Day, VJ Day, and the postwar period.

As an example, Mr. Pehrson, of the Bureau of Mines, recently made a statement in New York saying that the quicksilver reserve of the United States was 97 percent exhausted and that at prewar rates of consumption there was less than a three-year supply of quicksilver developed or undeveloped, discovered or undiscovered, in the United States. This aroused my intense interest, and in the lengthy period of five minutes over the phone I discovered that three mines in the United States, and not the top three producers either, but three mines of the list of ten had in excess of 75,000 flasks of quicksilver already blocked and ready to mine. This is not necessarily a criticism of Mr. Pehrson's article, but it is a criticism of the type of misinformation available in Washington.

It was only 1937 that the Bureau of Mines stated that it was impossible for American producers to produce more than 25,000 flasks a year. A glance at last year's and the year before's production indicates that those reports of 1937 were not even a good guess, since production rates in the United States for those two years averaged out about twice what the Bureau of Mines said the quicksilver industry could do.

It is interesting to note that of the eight current principal producers of quicksilver in the United States only one had any appreciable production in the year 1936, and that was from old dumps. None of the other nine mines now producing had any production to speak of in 1936. In 1937 average furnace feed was less than 6 lb. per ton. In 1945 the furnace feed is almost three times that. Is that a dead industry?

Everyone in the industry knows that the current requirements for quicksilver are in excess of any previous war years, yet the War Production Board has not seen fit to ask the producers for increased production or even to tell them that additional metal is desired. Furthermore, it has been a period of over a year since the War Production Board saw fit to call a Quicksilver Producers' Advisory Committee meeting. Apparently the War Production Board's idea is to keep the domestic producers in the dark while reasonably well-authenticated rumors have it that the Foreign Economic Administration is considering expanding high-priced foreign production even though no consideration is given to domestic producers.

In addition to these grievances of the domestic industry, they are further insulted by the importation of quicksilver from Spain. During the period that the Spanish government felt Germany would win, our government purchased quicksilver from Spain at a price in excess of $250 a flask, while paying domestic producers $190 and taking most of that back in taxes. When the Spanish government no longer thought that Germany would win, Spanish producers were permitted, apparently with the full approval of the State Department, to dump quicksilver in the United States at prices ranging from $149 to $160 at the same time it is alleged that the cartel, Mercurio Europeo, maintained a price of $279 a flask in England. In this connection, it is interesting to note, that for a good many years shipment of quicksilver into the United States has been a well-practiced method of avoiding European currency inflation and to obtain American dollars. Of all the high-priced commodities with a fairly ready market, mercury is almost the only one which is not under government control. Purchase of mercury in Spain and shipment to the United States in exchange for American dollars is almost the only possible method for Europeans (of whatever political faith) to obtain American dollar deposits. It is a well-known fact that the Germans had some appreciable amounts of quicksilver in Spain earmarked for them at the time the reoccupation of France cut off Spanish deliveries. The urgency with which quicksilver is being peddled in the United States makes one wonder what assurance we have that the dollars paid for this quicksilver are not dollars made available to high German officials.

S. H. WILLISTON

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NEW BOOKS

HANDBOOK OF MINERAL DRESSING. Vol. I, Ores and Industrial Minerals. By Arthur F. Taggart. John Wiley & Sons, Inc., New York, N.Y. Price $15.

Here is the new "Taggart." That statement is about all the review necessary for the book that has been the ore-dressing Bible ever since the first edition appeared in April, 1927.

But just to tell you a little about this new edition, we might mention that it is the first of two volumes that Professor Taggart plans to compile as his *Handbook*. Vol. I deals with the concentration of ores and industrial minerals; Vol. II, now in preparation, will take up fuels and the processes by which the "metalliferous and non-metallic concentrates are rendered into primary-consumer products."

This revision of the 1927 edition has involved rewriting the greater part of the book, and all data on plants, processes, and equipment have been brought up to date. The revised version is indispensable to the library of anyone connected with mineral dressing, regardless of whether or not he still has on his shelves a well-thumbed copy of the old Taggart.

The new book's treatment of dry grinding, dust collection, and industrial minerals is excellent, and the rewritten sections on flotation, sampling, and storage and transport of materials seem particularly well conceived and even more useful in a practical sort of way than similar sections in the first edition. Besides their practical value, whole sections of the book make very good reading, certainly an unusual quality in a handbook.

One will be arrested immediately by Professor Taggart's streamlined flowsheets. In fact, one should not begin digging into the text without reading the explanatory notes on flowsheets that begin on p. 2-02. The idea is good, and in most cases a simplified flowsheet results, but this reviewer is not convinced that for all flowsheets Professor Taggart's style is best. It is obvious that for the *Handbook*, the simplified, uniform style was an inspiration; but where one need not draw hundreds of flowsheets in a minimum of space, some latitude in choice of style might seem preferable.

This reviewer also realizes that he will probably find himself using not only Taggart's flowsheet style one of these days, but his formidable flowsheet shorthand as well.

There is no point in discussing each section of this book. It suffices to say that each one offers a balanced serving of theory, practice, and shrewd comment that make the volume a stimulating companion as well as a reliable reference work. You will want it.

ALUMINUM: AN INDUSTRIAL MARKETING APPRAISAL. By Nathanael H. Engle, Homer E. Gregory, and Robert Mossé. Published by Richard D. Irwin Inc., Chicago 4, Ill. Pp. 494. Price $6.

The authors of this elaborate study are professors in the Bureau of Business Research, College of Economics and Business, University of Washington, Seattle. The investigation was undertaken by the University at the request of Governor A. B. Langlie, and preliminary work was begun in 1941. The U.S. Department of Commerce and the Washington State Planning Council cooperated in the project; and more than 200 individuals and companies furnished technical and market data to field interviewers.

The study is essentially an appraisal of the postwar outlook for aluminum in the United States. In particular it seeks answers to questions growing out of (a) the eight-fold increase of wartime productive capacity compared with prewar production; (b) the limited domestic reserves of bauxite; (c) the shift of the producing center of the industry from the East and Southeast to the Pacific Northwest; (d) future competition in the industry; and (e) government ownership, through Defense Plant Corp., of six alumina plants, nine aluminum reduction plants, two rolling mills, and other facilities—all accounting for an investment of $633 million.

Being replete with statistical detail, the book can be reviewed only in outline, giving some general conclusions. For example, estimated minimum proved postwar reserves of high-grade bauxite show that the United States has only 5 million metric tons out of a world total of 374 million. In general, the reserves are not abundant in the major aluminum producing nations.

With regard to the large power requirements of the aluminum industry, the authors emphasize the ability of the Pacific Northwest, particularly Washington, to provide electric energy for reduction purposes at less than 0.2c. per kilowatt-hour and in sufficient quantity to produce 500 to 600 million pounds of metal per annum. The cost of Bonneville power is given as 0.131¢. per kilowatt-hour.

In a chapter on capital and management the authors analyze structure and ownership of Aluminum Co. of America, Reynolds Metals Co., Olin Corp., and Defense Plant Corp. Much of the information on Alcoa is taken from testimony and opinion in the government's suit against the company. Analyzing Alcoa's policy of long-range planning, the authors conclude that, despite lack of prewar competition, the company "actually accomplished quite satisfactory results" in providing aluminum for normal demand and in expanding to meet war needs.

With respect to metal production, the authors conclude that North America will probably come out of the war with close to two-thirds of the world's aluminum capacity, divided four or five to one between United States and Canada. In a chapter devoted to cost of production of aluminum, the elements of cost are given in great detail for the United States and for the five producing regions of the country. Postwar costs per pound of aluminum are estimated to vary from 10.63¢ in private plants in the Pacific Northwest to 12.63¢ at Torrance, Calif. Interesting conclusions are drawn on the postwar survival of plants, with a favorable nod in the direction of the Pacific Northwest, the Southeast, and New York State, except Long Island. The last named and those in New Jersey and Arkansas probably will not survive.

Markets for aluminum and competitive metals are studied extensively, industry by industry. The authors predict that, with a high level of production, employment, and national income, a market of 1½ billion to 2 billion pounds per annum is possible within five years after the war, depending on whether the price is 15¢. or 10¢. a pound for basic aluminum. Estimated postwar costs per short ton of pig aluminum, delivered in New York from selected aluminum plants, are: Pacific Northwest, $236; Niagara Falls, N.Y., $238; Massena, N.Y., $240; Alcoa, Tenn., $259; Torrance, Calif., $270; Listerhill, Ala., $278.

In order to implement the famous Article IV of the Atlantic Charter, the authors propose an International Bauxite Allocation Commission to work out a plan for equitable world production and distribution of bauxite and aluminum. Estimated annual bauxite requirements postwar are: World, 6,490,000 metric tons; U.S.A., 4,000,000, and Canada 800,000. A suggested plan of allocation for 60 years postwar shows the countries from which the U.S.A. would obtain its bauxite. The authors consider some such plan indispensable to a permanent industry in the United States and to a peaceful world.

Finally, the authors tackle the knotty problem of the disposition of government-owned aluminum plants. They reject the possibility of government operation in competition with private business, and believe that some high-cost wartime plants will be dismantled. Others may be disposed of by sale or lease, and some may be held in standby condition to meet a national emergency. The economics of location and cost of production will play a large part in the final decisions on disposition of plants owned by the government.

REGIONAL NEWS

ARIZONA

Steady production of many properties characterizes mining throughout State

★Production is now being maintained at the Iron King mine, at Humboldt, a subsidiary holding of Shattuck Denn Mining Corp., of Bisbee. The mill is treating 360 tons daily of lead-zinc-iron ore, the lead and iron concentrates being shipped to the American Smelting & Refining Co., at El Paso, Tex., and the zinc concentrates to Amarillo, Tex. The Iron King enterprise employs 125 men headed by H. F. Mills, general manager, with Elmer Tompkinson, mine superintendent, and R. Pessin, mill superintendent.

★Steady progress is being made by the Harvey Mudd interests of Los Angeles, Calif., at their Republic mine, 6 miles northwest of Dragoon, Ariz. Completion of the 150-ton mill for copper-zinc ores is expected in March. Considerable development work has been done at the mine while awaiting completion of the mill. This property will normally employ 100 men. The managing personnel consists of George Nicholson, general manager; A. W. Heuck, general superintendent; E. V. Given, mill superintendent; and G. A. Freeman, chief chemist.

★The Shattuck mine, at Bisbee, under lease by James S. Maffeo, is a steady producer of copper ore. Its production at present is approximately 400 tons per month. George Thomey is mine foreman and is working 18 men. This mine has been under lease by Maffeo for the past three years.

★The Tejon mine, in the Turquoise district near Gleeson, is shipping one carload of copper-lead ore per month to the American Smelting & Refining Co. at El Paso, Tex. Steve Prior is the owner and operator and has been producing for over a year.

★The Rosemont mine, in the Helvetia district near Greaterville, is shipping four carloads of copper ore to the American Smelting & Refining Co. at El Paso, Tex. This mine has been under lease by James Maffeo and Alma Greenhaulgh since 1941 and has been a steady producer since. Ten men are employed under the foremanship of A. Greenhaulgh.

★The State of Texas mine, in the Huachuca Mountains near Bisbee, has become a producer of lead-zinc ores. Regular shipments are being made to the Shattuck Denn custom mill for processing. P. L. Bones is manager and Grace M. Sparkes is the owner.

Wabana iron mines, on Bell Island, Conception Bay, Newfoundland, controlled by Dominion Steel & Coal Corp., Ltd., comprise the British Empire's largest producer of iron ore. All four mines extend under the ocean from a minimum depth of 200 ft. to a maximum of 1,500 ft. The largest extends two miles under water. The view shows haulage, conveyor, and ship-loading system at the water's edge. Three Lions photo.

★Among new shippers during March was the John Nazik operation at the French Lilly mine, at Cleator. Ore contains lead, zinc, and gold.

★Great Western Mica Corp., John G. Becker, secretary-treasurer, is preparing to open its mica property in the northwest corner of Mohave County. The mica is said to be of good quality muscovite, in a quartz-pegmatite dike with schist walls.

★Campbell Brothers are milling fluorspar ore and making regular shipments from their property southwest of Wickenburg, Ariz.

★Springfield Copper Co., Crown King, has finisned sinking the shaft another 100 ft. and has resumed shipping copper ore. It is reported that ore from the bottom of the shaft assays 4 to 5 percent copper.

★John Christensen has started operations again at the Thunderbolt property 4 miles south of Cleator. Christensen is adding new equipment to the present mill and will now separate the lead and zinc, which in the past was shipped as one product.

★Ben Joy is shipping copper ore from the Yellow Kid, east of Mayer, in Yavapai County. This property is under lease from Pierre Perry, who has several operations under way in Arizona.

★G. H. Dunning, director, Arizona Department of Mineral Resources, has been granted a sufficient premium to permit resumption of operations on the Humboldt tailings. Installation of a new ball mill will raise mill capacity to 100 tons a day. This activity was shut down in December but will resume in expectation of treating about 5,000 tons of tailings. Dunning is given considerable credit for making reduction of this dump possible. This was prior to his appointment as head of the Department, and the property is now worked by others.

★For source data, a sheet recently compiled and distributed by the Arizona Department of Mineral Resources is outstanding for mining people in Arizona, telling them "What to Do and Where to Do It." The business of mining, both large and small, has become increasingly complex. Failure to

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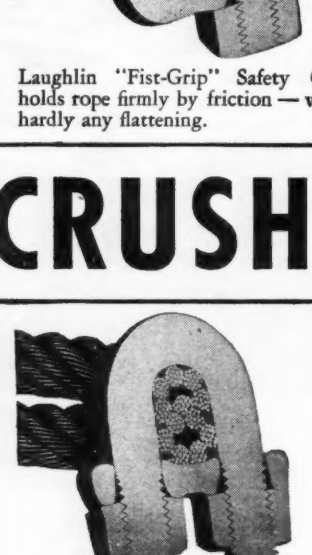

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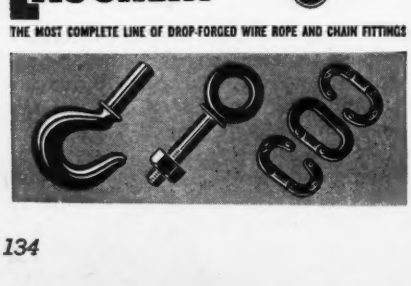

Arizona *(continued)*

comply with established rules, regulations, and directives, officials point out, not only slows up operations, but may involve substantial penalties. Additional information may be obtained from Department headquarters in Phoenix or through correspondence with field engineers in Globe, Kingman, Prescott, and Tucson. Communications directed to Field Engineer, Arizona Department of Mineral Resources, to the towns mentioned, will bring replies.

ARKANSAS

Floods reduce production of manganese ore in February—Davis mill to add equipment

★Snow, sleet, rain, and floods, which ran through the latter part of February and into early March, lowered the production of manganese ore in the Batesville-Cushman field. Roads leading to the mines off the highways were impassable for several days at a time. Total production in the field in February ran to only 720 tons, of which 300 tons was high grade and 420 tons low grade. The high grade, which met the phosphorus specification, was purchased by the Metals Reserve buying depot at Batesville. Purchases by the depot were fairly heavy in February up to the flood period.

★Correction. In the January issue of E.&M.J. it was erroneously stated that "Major Ruggles, who is in charge of Metals Reserve buying depot at Batesville . . . says that the closing of the depot is now set for July 1, 1945." It should have been reported that buying of manganese would cease after July 1, 1945, but that this schedule is subject to change.

★A group of Florida men were in the field the latter part of February, investigating low-grade ore deposits and their chemical values for fertilizing purposes. They were reported as satisfied with the results and will probably put in a drying and processing plant soon. They have leased a site.

★Davis Mining Enterprises, in charge of John Mothershead, operating the Polk-Southard and Southern Hill mines, near Cushman, produced 240 tons of high-grade ore during February. Their new mill, which is the largest washing and concentrating plant in Arkansas, is operating satisfactorily. They will install two additional pumps and one additional log washer in the near future. Because of bad weather the mill ran only ten days during February. Their pit mining operations on the Southern Hill require the removal of 25 ft. of overburden. The ore-bearing clay is about 35 ft. thick, and the owners estimate that they have enough tonnage to continue operations on the property for 15 years.

★James Rogers, of Harrison, operating the Coon Hollow property, at Zinc, Boone County, will run the small mill on the Moark company's property until he gets his new mill built and in operation. He hasn't completed plans for installation of the new plant.

★Lewis Flader & Associates, operating Section 16, near Buffalo, in Marion County, have been slowed down by bad weather, but underground operations are still under way. Their headquarters are now in Yellville. From the present outlook, they will be one of the largest producers in the field when they get their new plant in operation.

★The Arkansas Mining & Refining Trust Co., John Stone, of Harrison, in charge of operations, were the only producers in the field in February. They operate the North Star mine, on Crooked Creek, near Harrison. They are now mining and shipping high-grade zinc sulphide ore. Shipments in February ran to eight cars. Operations were slowed down by bad weather. Test runs indicate that under normal weather conditions they can ship a car of ore a day.

★Reports by the U.S. Bureau of Mines indicating that a considerable tonnage of ore would be lost if six underground mines ceased production upon termination of Metals Reserve contracts induced the Arkansas Congressional delegation to press for government purchase of ore already developed but not mined. After two months of effort, no definite action has been taken and the mines are now largely caved.

★The recent expansion in the production of metallic aluminum has been reflected in doubling production of alumina at the Hurricane Creek alumina plant of D.P.C., operated by Alcoa.

★Governor Laney has appointed a 15-man board, authorized by the Legislature, as the Arkansas Resources and Development Commission. This commission will consolidate activities heretofore administered by seven separate boards. Among these was administration of the State Geological Survey. The new director of the Geological Department under the consolidated board has not yet been appointed. Planned to work closely with the new consolidated board is a research program under the supervision of the University of Arkansas. The present Legislature has appropriated $100,000 for this work.

COLORADO

Gold producers organizing—Sternberger claims taken over by local mining men

★Merrill E. Shoup, president of Golden Cycle Corp., is president of a newly formed organization—Western Economic and Mining Affiliates, Inc.—to provide stronger Washington representation for gold mining and milling.

C. N. Bell, of Ouray, former president of the Colorado Mining Association, is treasurer, and Robert S. Palmer, secretary of the Colorado Mining Association, is managing director. The organization is announced as temporary in character. Among local mining associations which have indorsed it are those of Clear Creek and Lake County, Mr. Shoup has spoken in California and elsewhere about it, and says that everywhere he has had a favorable reception. Concretely, its founders plan to work for preservation of gold as a monetary metal, and for reopening the gold mines. Naturally, they are against the Bretton Woods agreement. They also suggest that the Colorado Mining Association, plus groups from Utah, Nevada, and Idaho, will offer amendments to the reciprocal trade agreements act before its renewal, providing that proposed reductions of tariff shall be made public at least six months in advance and be subject to the veto of one-third the Senate; that escape clauses shall be invoked at any time during the life of the treaty by a vote of one-third the Senate.

★Current Bureau of Mines exploration programs in Colorado include work on fluorite at Jamestown and at Walden. At Jamestown the investigation is general, with some drilling contemplated. At Walden, in North Park, core drilling has been superseded by a program of sinking a 107-ft. shaft from which crosscuts have been run at the 50- and 100-ft. levels to both limits of the vein. At the Camp Bird mine, at Ouray, the Bureau is core drilling for zinc ore below the 1,400-ft. level. At Kokomo, a shaft is being sunk between the Wilfley and Kokomo-Kimberly properties, with the idea of testing lead-zinc ore from both. Some geophysical work probably will be done later. At Leadville, exploration of zinc carbonate is proceeding, particularly on ores to be made accessible by the deep-drainage tunnel. Geophysical tests of Leadville manganese probably will be followed by core drilling later to test results.

★The Colorado School of Mines has received a grant of $7,500 from the Rockefeller Foundation to purchase equipment for its intensive course in English for foreign students, which was conducted on an experimental basis last summer and has now become an integral part of the curriculum. Four students are taking the course this winter. The classes are to be limited to 20. According to Dr. M. F. Coolbaugh, president of Mines, most foreign students have in the past been severely handicapped by an insufficient knowledge of English to grapple with the complexities of scientific and engineering terminology along with those of ordinary English.

★In a recent monograph issued as a quarterly by the School of Mines, William S. Levings, of its Geology Department, predicts a tremendous postwar expansion of aerogeology in mineral exploration, through extensive use of faster color film and of the perfected helicopter. He makes the point that prewar color film was not fast enough to take sharp photographs

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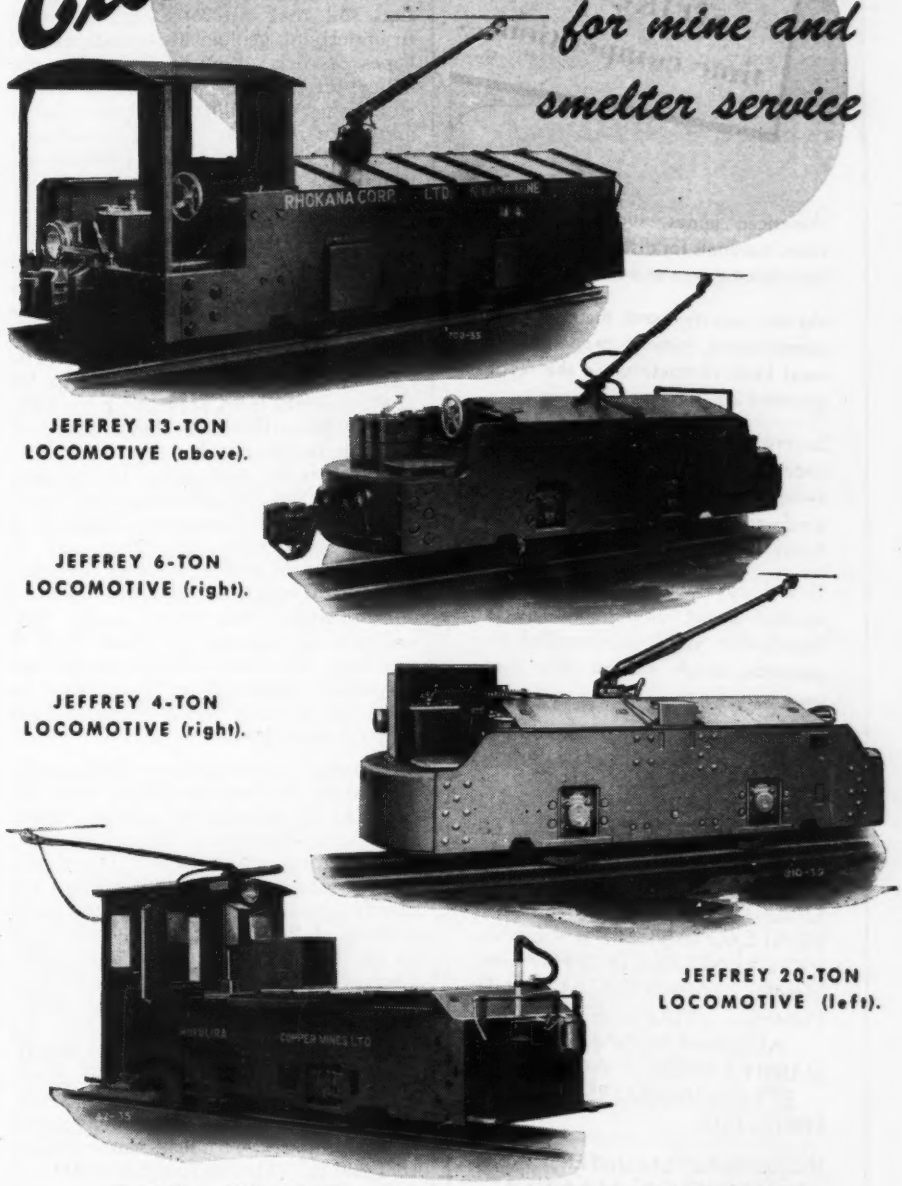

JEFFREY 13-TON LOCOMOTIVE (above).

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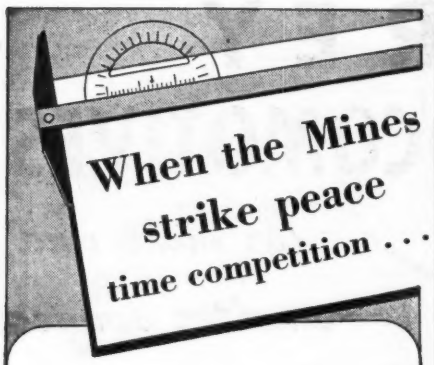

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Colorado (*continued*)

of the terrain from a fast-moving airplane. Study of black-and-white film produces evidence of shades but none of color, although use of the eye and some use of color photography have demonstrated the immense value of color as seen from above in identifying vegetation, soil, rock outcrops, etc., as a clue to underlying geological formations and types of rock. Levings feels that the helicopter, with its hovering characteristic, plus its ability to land almost anywhere for closer visual inspection, will come into tremendous postwar use in mineral prospecting.

★The "Galloping Goose," pet name of the little narrow-gage Denver and Rio Grande Southern R.R., which runs 172 miles through the San Juan Mountains of southwestern Colorado, serving mines along the way, seems safe to continue operation for the time being. The "Goose" has been in receivership for years and has been kept going by RFC loans. Recently Cass Herrington, of Denver, receiver, asked the U. S. District Court for permission to abandon operation, but shippers along the route, including mine operators, pledged a voluntary increase of $20 a car in freight rates, and officials of the five counties through which the "Goose" runs pledged that they would subordinate tax claims to a new loan, if granted. The U. S. District Court has suspended judgment on the petition to abandon, pending action on request for a new federal loan.

★A group of persons from Georgetown and Idaho Springs has taken over the Sternberger collection of mining claims, largest in Clear Creek County and one of the largest in Colorado. The claims extend into Gilpin County. They are chiefly gold properties in the lower portion of Fall River, a five-mile strip to the Russell Gulch district in Gilpin County, a tract on Clear Creek where Fall River enters it, and other placer claims and millsites. Included in the transfer is the Lucania tunnel, 7,000 ft. long, which undercuts the Fall River claims, heading toward Russell Gulch. There are also half a dozen other tunnels on the property, with lengths ranging up to 1,000 ft. Also included is a 600-kw. hydroelectric plant on Fall River, now under lease to the Public Service Co., of Colorado. The claims were originally put together more than 40 years ago by Sam and Leopold Sternberger to be operated under the name of Pennsylvania Mining Co.

★WLB has affirmed a decision of the Nonferrous Metals Commission directing U.S. Vanadium Corp. at Rifle to continue portal-to-portal payments and premiums for night work of four cents an hour for the first shift, eight for the third, and six for the intermediate shift. The Commission denied two weeks' vacation with pay after two years' employment for Vanadium Co. of America employees at Naturita, who now get one week after one year and two weeks after four years. It orders muckers' pay increased from 75 to 82c. an hour and that of miners from 83 to 90c. plus night differentials as above.

★Lark Mining Co., near Silverton, reports striking a new orebody with good values in lead, zinc, copper and gold, while driving an 850-ft. lower tunnel away from the main shaft.

CALIFORNIA

Alhambra reported leased to Eastern interests—Zinc production at Blue Moon

★It is reported that Eastern interests have leased the noted Alhambra gold mine, near Kelsey, El Dorado County, from the Alhambra-Shumway Mining Co., and limited mining operations have been resumed under the direction of W. W. Williams. The property attracted considerable attention during 1939 and 1940 because of discovery of a high-grade orebody below the old workings, from which a production of nearly $1,000,000 was shipped to the United States Mint in San Francisco.

★Production of zinc continues at the Blue Moon property, near Hornitos, Mariposa County, operated by Red Cloud Mines, Inc., subsidiary of Hecla Mining Co. of Wallace, Idaho. The mine is considered one of the leading zinc producers in the State. Concentrates are sold to Metals Reserve Co. Development work in progress includes driving of laterals on the 400-ft. horizon opened up recently, following the deepening of the shaft. Mined ore is treated at the 150-ton mill formerly handling gold ore from the Jenny Lind property and remodeled by the present company for milling zinc ores. R. W. Neyman is general manager of Red Cloud Mines, with R. H. Dunn, superintendent directing operations at the property.

★Underground development work and driving of a lower tunnel continue at the property of United States Vanadium Corp. near Bishop, Inyo County, but milling operations were suspended a short time ago because of insufficient tonnage of custom tungsten concentrates. Treatment of company-mined tungsten ore was stopped late in 1944 after suspension of mining operations forced by shortage of labor. The long tunnel is driven under contract by Morrison-Knudsen Co. W. N. Shaw, superintendent, is in charge of operations.

★Mt. Raymond Mines Co. is reported preparing to reopen its lead-zinc-silver property near Madera, with preliminary work centered on building an access road. Installation of equipment is planned.

★A claim of nearly half a million dollars against Walker Mining Co., Plumas County, has been allowed to International Smelting & Refining Co., Salt Lake City, Utah, by the federal district court in the latter city. Judge Johnson

approved findings of fact, conclusions of law, and suggestions of special master T. D. Lewis verifying the claim of $484,909.45 plus interest. The judge held that, despite ownership of a controlling interest in Walker by International, the latter had advanced the money as a loan and not as a capital investment.

IDAHO

Annual reports of leading companies reveal interesting data on operations

★Two new promising mineral developments were made in the Coeur d'Alene district last month. Both are in the Coeur d'Alene Mines Corp. shaft development, and on the west and east sides of the Polaris fault, which passes through the Coeur d'Alene Mines property. The first showing is on a vein which appears in the south crosscut on the 2,200 level and is believed to be a portion of the Chester vein developed in Polaris ground farther west. Drifting westerly on this vein has progressed about 175 ft. and has shown good milling ore from a few inches up to six feet in width. All of the drift muck is being put through the mill and is reported to have paid the cost of the work.

The second mineral discovery was east of the Polaris fault, farther north on the 1,000 level of the Coeur d'Alene Mines shaft, where the Merger Mines Corp. has developed a vein of lead-silver ore about four feet wide of good mill feed, averaging around 10 percent lead. Morris Pearson is manager of the Merger.

★Hecla Mining Co. directors have declared a dividend for the first quarter in 1945 at the rate of 25c. per share, totaling $250,000, which brings the company's total dividend payments to date to $28,405,000. Hecla's original mine, at Burke, has been exhausted, but the plant is still in operation on the Star mine, in which Hecla is half owner with Bunker Hill. Hecla also owns control of the Polaris mine, adjoining Sunshine, and which has developed the largest and richest silver-lead orebody found in the United States in recent mining history. Other interests by Hecla in the Coeur d'Alene district include the Osburn tailings plant, treating 2,000 tons of tailings per day; the Silver Cable mine, east of Mullan, which, during an operation season of about nine months, produces approximately 80 tons per day of high grade zinc-lead ore; and a half interest with Bunker Hill in the Sullivan zinc plant, at Kellogg.

★Silver Dollar Mining Co. has announced its second payment of 2c. per share on "A" stock as a return on past assessments levied against the stock, which totaled 14 in number at the rate of 1c. a share. The present return payment amounts to $20,000 and brings the total returns paid "A" stockholders to $40,000. The Silver Dollar company is now starting new development

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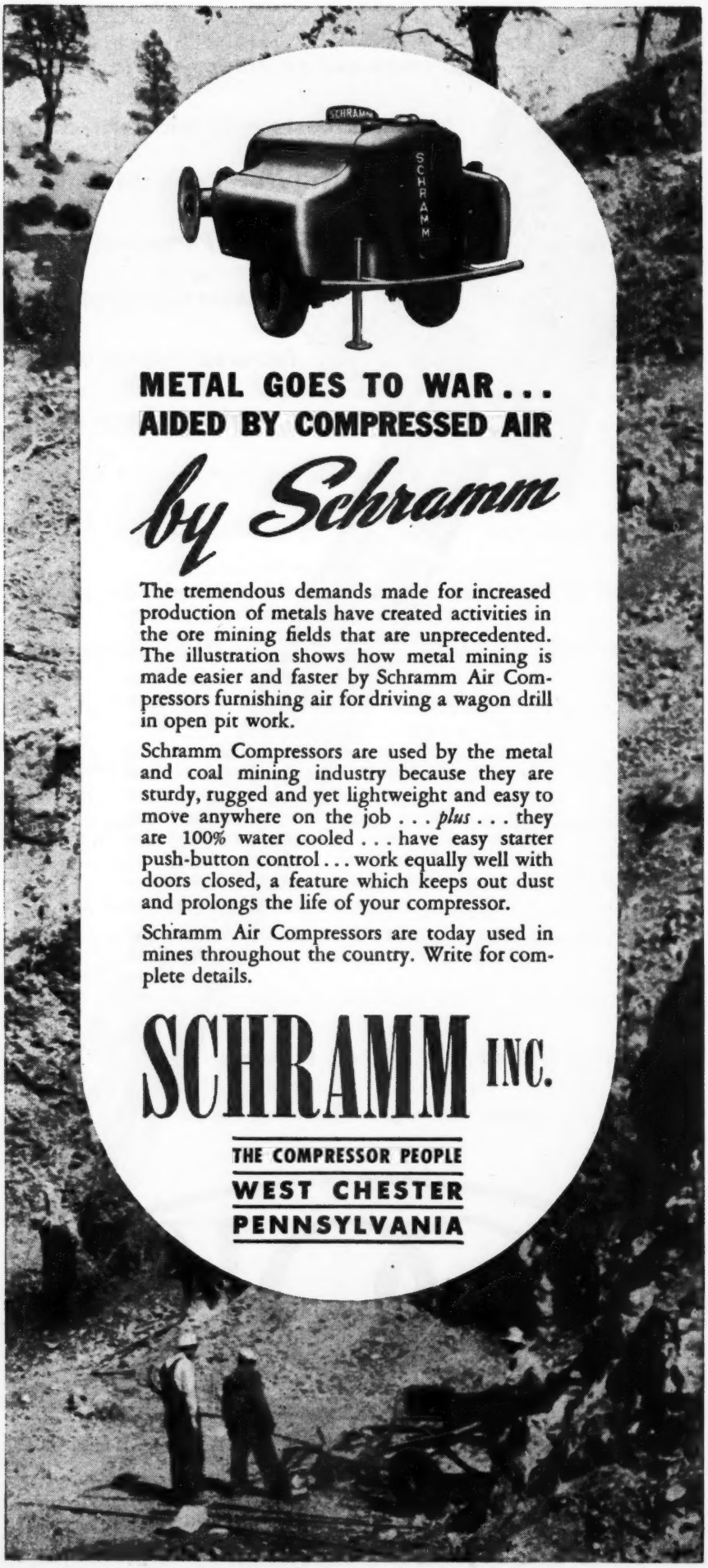
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Idaho (*continued*)

work on the Chester vein about 2,500 ft. east of the area under production and will continue sinking its main shaft from the 1,800-ft. level an additional 1,000 ft. to sea level, on which horizon the vein will again be crosscut and prospected by drifting.

★Leasers operating a power-shovel dredge in the South Fork of the Coeur d'Alene River between Wallace and Mullan in a period of about three months cleaned up 6,700 tons of zinc-lead tailings, which were treated at the Golconda mill and produced six carloads of lead concentrates and six carloads of zinc concentrates.

★The Independence Lead Mines Co., owning property between the Federal company's Morning mine and the Gold Hunter mine, has purchased two additional mining claims between the Hunter and Lucky Friday mines, extending the company's mineral holdings two miles east from the Morning property.

★The Silver Chieftain Mining Co. has made arrangements with the Silver Dollar Mining Co. whereby Silver Chieftan ground will be prospected from the sea-level horizon as soon as the Silver Dollar shaft is completed to the 2,800-ft. level. Both Silver Dollar and Silver Chieftan are located on the Chester fault-vein system. Extensive drifting operations on both properties from the 1,800 level disclosed a highly mineralized vein but no major-sized orebodies.

★A deep mining development program existing between Sunshine and Metropolitan mining companies has been extended for a period of two years on account of the current labor shortage. Under the agreement Sunshine has already completed a long crosscut into Metropolitan ground from the 3,100-ft. level and has cut a vein of silver ore close to the dividing line between the two properties. No drifting has been done on the ore in Metropolitan ground, but Sunshine has drifted 800 ft. on the shoot in Sunshine ground, opening continuous ore with average values of 19 oz. in silver. Originally this is what was known as the "Yankee Girl" Vein. Sunshine now calls it the South Vein.

★Leasers of the Gold Hunter mine, at Mullan, Roy Norris and Gust Almquist, have installed a Fahrenwald type zinc flotation unit in the 500-ton capacity Hunter mill in an effort to recover zinc values which have formerly gone into the tailrace. Zinc values in the Hunter ore are very low, and this is the first time in the history of the mine that an effort has been made to save them. The leasers are operating on filling and low-grade ores left by the old company in removing the higher-grade ores. The concentrate produced by the leasers is a high-grade lead-silver product.

★The Lucky Friday Silver-Lead Co. is shipping 2,500 tons of mine run ore to the Golconda mill. The company has recently installed a new 200-hp. electric hoist and is now engaged in sinking from the 800 to the 1,000-ft. level. It is

estimated it will take about 50 days to complete this work.

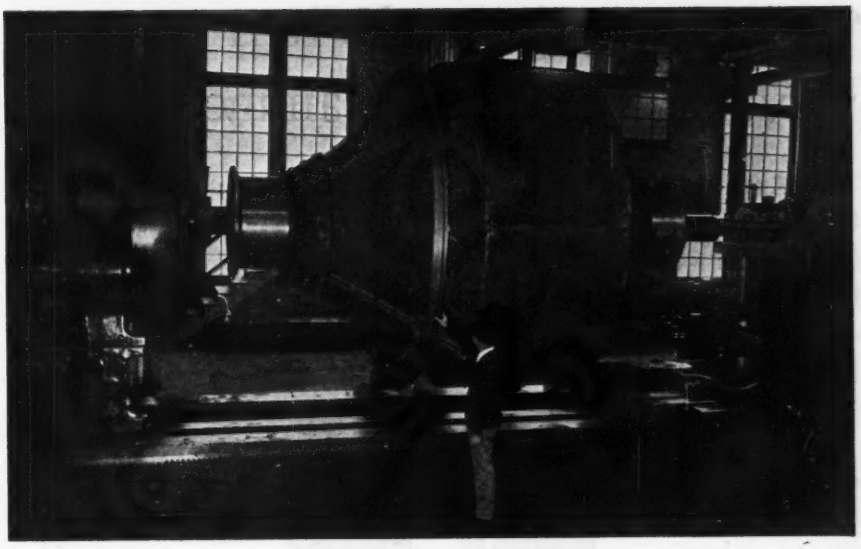
★Federal Mining & Smelting Co. has declared its first quarterly dividend for 1945, on 246,640 shares of outstanding stock at the rate of 75c a share and totaling $184,980. This brings the company's total dividend record to date to $30,425,860. The company's Morning mine, at Mullan, was closed for the entire year of 1944 except for ore produced in new development work or from leasing operations in the upper levels. The mill, however, has been in steady operation on low-grade feed from the mine dumps, leasers' ore, and about 100 tons a day from the company's Frisco mine, at Gem. Federal's Page property, at Kellogg, is the company's most profitable operation in the Coeur d'Alene district at the present time. The lower workings of the Page have developed a major-sized body of lead and zinc ore in the past few months.

★In the Sunshine company's annual report, R. D. Leisk, manager, gives the first official account of the development of the Chester vein. He says:

"Development and exploration work was concentrated on the lead-silver ore zone discovered in 1943 along the Chester vein and Silver Syndicate fault. A conflict of ownership of ore in the Chester vein in territory adjacent to Sunshine's original east boundary was satisfactorily settled by an agreement creating the "Rotbart" area, in which the ownership is divided equally among Sunshine Mining Co., Polaris Mining Co., and Silver Dollar Mining Co. The Rotbart area has an east and west dimension of 400 ft. and is contained within the "Omega" area, which continues for about 1,400 ft. to the east of the Rotbart area. The Chester vein in the Omega area is owned by Sunshine Mining Co. and Polaris Mining Co. in equal shares.

"A new agreement was negotiated with Silver Syndicate, Inc., in which Silver Syndicate conveyed to Sunshine a 50 percent interest in all of Silver Syndicate's mineral holdings, including apex rights on some 4,100 ft. in length on the strike of the Silver Syndicate fault. This agreement replaced an earlier leasing arrangement under which Sunshine held a 60 percent interest in ore on a strike length of 1,100 ft. on the Silver Syndicate fault, and has the effect of increasing the length of the "Rambo" area to 4,100 ft.

"Following signing of the Rotbart agreement, the Chester vein was developed in the Rotbart area on several levels with excellent results. The orebody appears to be wider and above average grade in this area. It is continuous from the 2,500 level to the 3,100 and may reasonably be expected to extend below the 3,700 level. Work on the Chester vein on the 2,300 level showed spotty ore in several places in the Rambo and Rotbart areas, but no continuous oreshoot. A crosscut was driven to the vein in the Omega area on the 1,900 level, but no ore was found. About 1,100 ft. of crosscutting and drifting was done on the 3,700 level to



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"Window" Shows When to Reverse or Replace Hammer Heads

The Amsco-Clark renewable-tip pulverizer hammer (Patent applied for) has a number of features that promote economical operation in both large mills and small.

First, and inevitably, because no adequate substitute has been found, it is made of austenitic manganese steel, "the toughest steel known" which retains its shock-resisting toughness while the characteristic surface work-hardening takes place; factors that preclude breakage and rapid wear.

S 14-A

Then, not only is the head or tip of this hammer renewable, but it is also reversible end for end, which assures double wearing life. About 75% of the tip metal can be used, while the duplex shank, of comparable weight, will outlast a lot of tips.

The "windows" or holes in the tip sides show the operator the limit of tip wear before the shank hooks are attacked and, incidentally, also reduce the weight of the head.

Other advantages:

The tip new or worn cannot come off the shank as long as the latter hangs on its supporting rotor pin, regardless of the assembly bolt.

But the tip is easily unhooked by spreading the shank halves apart after removing the assembly bolt; and a new head is quickly applied by reversing this operation. The assembly bolt is firmly locked with a standard split cotter.

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Idaho (*continued*)

prospect the downward extension of the ore developed on 3,100. The 3,700 crosscut entered the zone west of the known oreshoot above and it was necessary to drift east to the point of intersection of the Silver Syndicate fault with the Chester vein in the Omega area, where ore of good width and grade was encountered.

"Much additional work will be required to determine fully the extent of the ore zone on 3,700. The most extensive development to date has been on 3,100, where the ore is continuous for a length of 1,000 ft. The average grade of all ore produced from the Chester vein and Silver Syndicate fault zone in 1944 was 6.3 percent lead and 44.6 oz. of silver per ton. About 40 percent of this tonnage came from development work."

UTAH

Vanadium Corp. takes over mill formerly operated for Defense Plant Corp.

★Reflecting increased demand for vanadium, the Vanadium Corp. of America has resumed milling at Monticello, San Juan County, formerly operated by it as agent for Defense Plant Corp. The plant, not far from the point where corners of four states meet, was closed early in the spring of 1944 after Metals Reserve Co. had built up stocks to a point where it was considered safe to cease operations, said A. A. Sproul, general superintendent of the Vanadium Corp. He stated that his concern has purchased from Metals Reserve the stockpile of ore at Monticello, which represents nearly a year's run, and has leased plant facilities from D.P.C. If the operations prove satisfactory, the company plans to operate mines and purchase ore again. The ore was obtained from small and widely scattered deposits in the McElmo sandstone over an area of some 200 square miles, requiring intensive prospecting. Ninety men were employed at the plant when it was closed. The company is seeking to reemploy 60. Baxter Blitz is mill superintendent at Monticello.

★Federal District Judge Tillman D. Johnson, Salt Lake City, on Feb. 9 approved a claim of International Smelting & Refining Co. of almost half a million dollars against Walker Mining Co., Plumas County, Calif. Judge Johnson approved findings of fact, conclusions of law, and suggestions of Special Master T. D. Lewis, verifying the claim of I.S.&R. to $484,909.45 plus interest. Despite the fact the smelting company, controlled by Anaconda Copper Mining Co., owned a controlling interest in Walker Mining Co., it had advanced the money as a loan, not as a capital investment, the judge ruled.

★The Utah Labor Relations Board on Feb. 21 certified local union No. 820 as

collective bargaining agent for employees, exclusive of supervisory employees and clerical staff, of metal producers at the Horn Silver mine, west of Milford.

★Nine issues were decided by the Nonferrous Metals Commission Feb. 21, in settling a dispute between Utah Copper Co. and 37 employees of the company's central power plant, at Magna, represented by International Brotherhood of Electrical Workers, AFL. A general wage increase of 17¢. an hour sought by the union on the basis that wage rates should be compared with utility rates instead of rates in the mining industry, was denied. To correct intraplant inequities, the company was ordered to increase pay of turbine engineers from $7.70 to $8.45 a shift, and utility men and yardmen from $6.35 to $6.45 a shift. Extra pay of 4¢ an hour for second shift and 8¢. an hour for third shifts was ordered.

★Decreased tonnage and value of ore produced by Silver King Coalition Mines Co., Park City, are shown in the annual report. During the year, underground operations were reduced from two shifts to one shift to utilize a larger proportion of manpower in extraction.

Comparative Operating date are:

	1944	1943
Tons of ore mined	54,546	96,019
Net return, value	$1,254,877	$1,911,850
Tons crude ore	294	219
Tons ore milled	54,252	95,800
Pounds lead	7,299,658	13,426,580
Pounds zinc	3,370,069	7,504,612
Ounces silver	477,941	816,620
Ounces gold	556	1,093
Pounds copper	243,953	451,635
Net smelter return	$765,004	$1,911,850
Metal premiums	489,872	.....
Total operating revenue	1,254,877	1,911,850
Other income	13,290	14,693
Total revenue	1,268,167	1,925,544
Total costs	1,236,883	1,666,755
Profit before depreciation	31,284	.....
Depreciation	24,413	41,803
Net profit to surplus	6,870	217,985
Current assets	1,108,106	1,176,865
Current liabilities	86,124	163,260
Dividends	.....	366,140

★Two hundred eighty-three of Utah Copper Co.'s 1940 mill employees and 150 of its 1,750 mine employees are women, D. D. Moffat, vice president and general manager, announced March 11 in connection with presentation of the fourth Army-Navy "E" award to the company and its employees. Of a total of 3,690 employees, 417 had been hired since the second "E" award was received in June 1944.

NEVADA

Occurrence of nickel confirmed by Bureau of Mines—Grand Deposit plans mill

★A drilling and development project covering a large area at Copper Flat, two miles west of Yerington, in Lyon County, started in the summer of 1942, has been completed by the International Smelting & Refining Co., Anaconda subsidiary. Alex M. McDonald, long with Anaconda, was transferred from Butte to take charge. Drilling contractors have operated seven dia-

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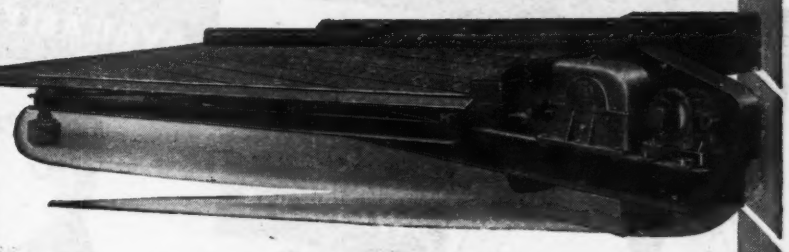

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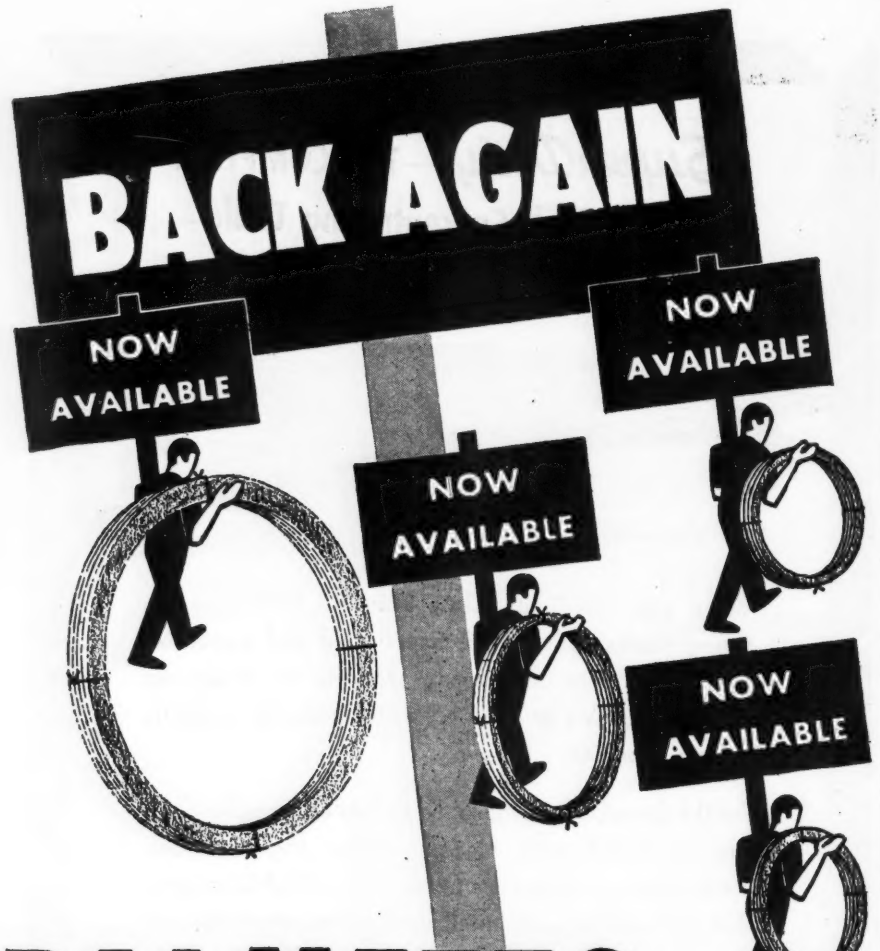

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Nevada (*continued*)

mond drills and five churn drills. A three-compartment shaft was sunk about 400 ft., opening a heavy flow of water. All activity has now ceased.

★Several lessees are producing cinnabar from the Pershing Quicksilver Co. mine, in the Relief district, Pershing County, at one time the State's largest producer of mercury. Long owned by a Chicago banker, the mine, with 60-ton rotary and 80-ton Herreshoff furnaces, was purchased last summer by Reno operators, who have disposed of nearly all plant equipment. A clean-up of the old plant produced a half-dozen flasks of mercury.

★In zinc production, Nevada mines established an all-time record in 1944, with total of 41,750,000 lb., more than 80 percent of which came from the Pioche district, in Lincoln County. Lead was above any year since 1941, but gold and silver were below any year since 1933 and copper was lowest since 1938. The Getchell mine, in Humboldt County, continued for the sixth year the leading gold producer, permitted by the WPB to operate because of its output of arsenic, recovered as a by-product in roasting sulphide ore.

★Field men of the FHA have been at Eureka to design plans for a housing project at the Richmond-Eureka mine, on Ruby Hill, where the Eureka Corp. Ltd., Thayer Lindsley, of Toronto, president, is preparing to sink its four-compartment shaft, now at 600 ft., to at least 2,500 ft., the horizon at which lead-zinc-silver-gold ore has been found in drilling. Complete equipment is being provided for a deep operation, including a new headframe, an electric hoist, and a diesel power plant to replace the smaller unit destroyed by fire in October. William Sharp is directing engineer for the Eureka Corp., subsidiary of Ventures, Ltd.

★Field tests by examining engineers of the U. S. Bureau of Mines have established the presence of nickel in a 12-ft. vein or dike on claims at Paymaster Canyon, 16 miles northwest of Goldfield, located by Rosco Wright, widely-known prospector of Esmeralda County, known as "Death Valley Curly." The green ore has been tested repeatedly for copper, with negative results. A Bureau engineer said there were indications of shoots, seams and pockets of ore having a high nickel content.

★Lessees working through the Mizpah shaft of the Tonopah Mining Co., of Nevada, in January shipped 13 carloads of silver-gold ore to a Utah smelter. Other shipments included 11 cars of smelter slag from the Tybo lead-zinc mine, 60 miles east of Tonopah. One carload of Mizpah ore sampled $135 per ton.

★In its annual statement of business transacted in Nevada, the Callahan Zinc-Lead Co., operating the Mount Hope zinc-cadmium mine, near Eureka, from which a few shipments were made

early in the year, reports receipts of $14,482 and disbursements $203,245. The company has constructed a 250-ton selective-flotation mill.

★The Nevada-Massachusetts Co., for many years largest U.S. tungsten producer, is drilling and developing a group of scheelite claims near Paradise hill, in Humboldt County. John Etchart is in charge.

★Shipping ten carloads monthly of ore containing silver, gold, copper, lead, and zinc, the Grand Deposit Mining Co., Paul C. Lyon, Atlas Building, Salt Lake City, president, is reported to be planning early construction of a selective-flotation mill at the mine in the Muncy Creek section of the Aurum district, in eastern White Pine County. A lessee has been shipping ore.

★A 30-ton tungsten concentrator at Toy, a rail station in Pershing County, has been acquired from the Contact Mining Co. by Don Burgner, of Reno, who lately purchased the Valley View tungsten mine, in the Potosi district, Humboldt County. He will truck the scheelite from a developed 10,000-ton reserve.

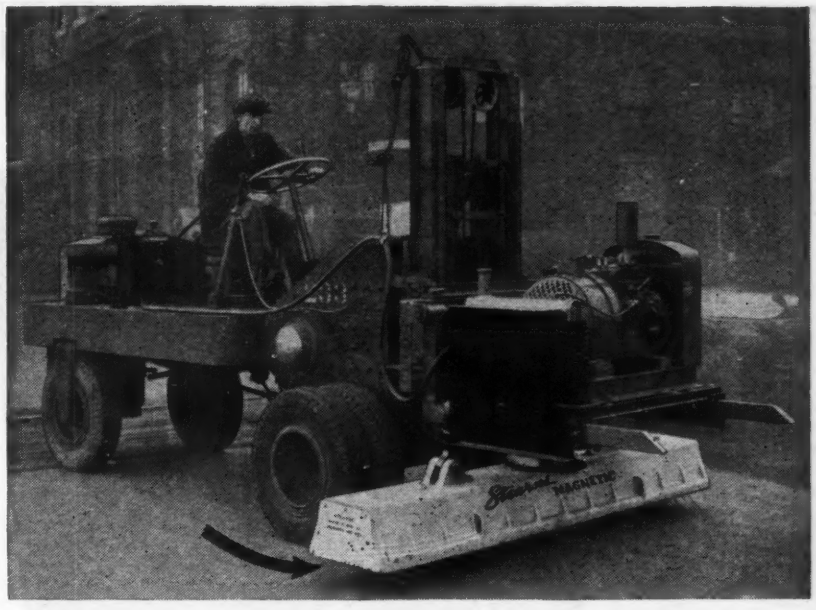
★Six substantial buildings, including plant structures, have been completed at the Blue Bucket cinnabar mine of Molybdenum Products Co. in the Bottle Creek district, Humboldt County, E. George Howe, Winnemucca, president and manager. Plant equipment, involving a calcining and sintering process, has been fabricated in a San Francisco foundry and will be operation soon.

NEW MEXICO

WMC acts to relieve shortage of miners in Silver City lead mining area

★Gallup American Coal Co., New Mexico's largest coal producer, owned by Kennecott Copper Corp., was scheduled to shut down completely March 31, according to an announcement by Clarence Uhland, resident manager, and confirmed by Horace Moses, general manager of Chino Mines division of Kennecott. Principal customer of Gallup American for many years was Chino Mines, operating a mine at Santa Rita and mill and smelter at Hurley, which several years ago electrified operations and changed to natural gas as fuel. With the Santa Fe railway also reducing its purchases of coal, having largely converted to oil-burning and diesel locomotives, further operation of the Gallup mine is not economical, according to Kennecott officials.

★Acting to meet a critical shortage of labor in the Silver City mining area, State WMC Director at Albuquerque, L. E. Ruffin, sent to the district early in March J. C. Mitchell, State WMC Placement Officer, and George N. Tribble, of the WMC Utility Division,



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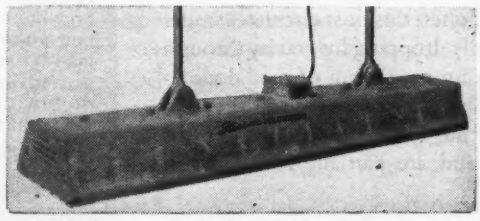

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PRODUCE

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New Mexico *(continued)*

to assist the Silver City District Office of the United States Employment Service in securing additional labor needed by the mining companies. Demand for increased lead production resulted in an immediate order being issued by the WMC, giving high priority to two companies—the Peru Mining Co., Joseph H. Taylor, general manager, and the Black Hawk Consolidated Mines Co., Ira L. Wright, general manager. Available miners and muckers in other districts will be shifted to this area, WMC Director Ruffin announced, to relieve a shortage of miners and to provide adequate labor to keep production at capacity to meet the demands of war.

★Warren C. Bracewell, State Mine Inspector at Albuquerque, on an inspection trip to the Silver City area the first week in March, said he was making more frequent inspection of mines in an effort to reduce fatal and lost-time accidents, which have increased in recent months. The mine inspector attributed this increase to expanded operations and employment of inexperienced workers because of a serious shortage of labor. He commended mining company operators and employees alike for their cooperation in preventing accidents and declared that safety consciousness by mine workers was far more effective than safety devices in maintaining a good non-accident record, although he said mine officials were utilizing such devices to the fullest extent.

TRI-STATE

Tar Creek property sold to Dines Company—Madison holdings bought by Evans

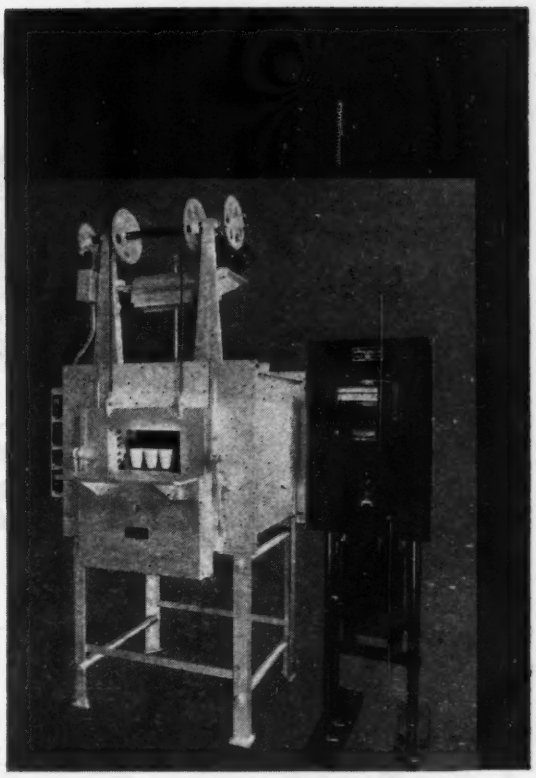
★Sale of the Tar Creek property of the Federal Mining & Smelting Co. to the Dines Mining Co. was announced March 1 by L. G. Johnson of Baxter Springs, district superintendent of the former company. In conjunction with the disposal of the Tar Creek mines, the Federal company suspended mine operations at adjoining and adjacent properties, including the Muncie, Semple, and Early Bird. Crews from these operations were shifted to company mines on the Joseph Buffalo allotment, including the Maxine, Walker, and Buffalo forties midway between Picher and Quapaw, which were closed following the destruction by fire of the company's Gordon Central mill two years ago. As is the case in company operations at the Lucky Syndicate and Howe mines, northwest of Picher, ore from the Buffalo allotment will be trucked to the Gordon central mill sampling plant for company sampling and thence by rail to the Eagle-Picher Central mill, south of Cardin, for treatment. H. G. Weidman, of Baxter Springs, manager of the Dines Com-

pany, said that mine operations will be continued from the old brownhead shaft on the Tar Creek property, which is situated about a mile northwest of Treece, Kan. Ore from the Tar Creek mines will be trucked to the Blue Mound mill of the Dines company, north of Picher, in Kansas, for concentration.

★F. W. (Mike) Evans, of Joplin, widely known Tri-State mine operator, has purchased the mines, mill, and lease holdings of the Madison Zinc Co., situated on the Thomas land a mile and a half southwest of Baxter Springs, at an announced figure of $75,000. With the assistance of Carl Carmean, a district mining engineer, Evans is making preparations to mine a large cave-in on the southeast forty of the 200-acre tract. The cave-in, which covers about four acres on the old Peru forty, occurred about six years ago as result of extensive mining over a period of years of a rich chimney of zinc-lead ores in that area. A taut-line cableway system of mining, entirely new to the Tri-State, will be inaugurated at the Peru property. Equipment used by C. F. Lytle, contractor on the Dennison dam, near Dennison, Tex., has been acquired by Evans for the development. A 10-ton skip will be operated in and out of the cave, vertically and horizontally from a 2½-in. steel cable suspended from steel towers on opposite sides of the cave-in, by means of a 225-hp. electric motor hoist made by Lidgerwood.

★A. A. Childress, of Joplin, who operates the Southern Mining Co. properties, a mile northwest of Treece, has obtained a lease on 240 acres of the Kropp land, a mile and a half north of Quapaw, where preparations are well under way for the opening of three shafts. The first shaft to be opened is the Southeast, or No. 1, shaft on the southeast forty. No. 2 shaft is situated 850 ft. to the north, and will be recribbed. No. 3 will be that of the old mill shaft on the Meteor forty. Derricks and 350-ton hoppers will be built at each shaft as it is reopened, and electric hoists will be installed. Mine operations will be carried on around the 220-ft. level at all three mines. Air for underground operations will be provided by a Sullivan compressor, belt-driven by a 165-hp. Bessemer gas engine, which will be moved from the Southern properties. Ore from the three shafts will be trucked to the custom mill of the Mission Mining & Royalty Co. for treatment, which adjoins the southeast forty on the south. Childress is continuing mine operations at the Southern properties.

★Tom Phelps, of Joplin, leaser of 145 acres of the old 1,000-acre tract of the Rex Mining & Smelting Co., east of Joplin, reported several rich zinc-lead ore strikes by churn drilling carried on this year as a project of the U. S. Bureau of Mines on his mine lease. At least four of the 11 holes put down by the Bureau disclosed an exceptionally rich run of ore. Assay of cuttings from the No. 8 hole on the lease showed a 65-ft. face of ore, from a depth of 65 to 130 ft., with weighted average recovery values



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4FM-2

Tri-State (*continued*)

of 4.12 metallic zinc and 4.80 metallic lead, according to L. C. Brichta, project engineer for the Bureau.

★John A. Skinner, of Webb City, chief mine inspector of Missouri, tendered his resignation to Governor Phil M. Donnelly, effective March 1, to accept a position as vice president and general manager of the Wentworth Mining & Milling Co., according to Edwin B. Meissner, of St. Louis, president and treasurer of the company. The Wentworth company has a mine and mill on the Kline land, a mile southeast of Wentworth, Mo., and is completing a new shaft. Considerable development work, including two more new shafts, will be done under Skinner's direction. About a year ago, the U. S. Bureau of Mines put down 54 churn-drill holes on the tract, blocking out approximately 500,000 tons of sulphide and siliceous zinc ores which will average around 3 percent metallic recovery, according to Louis C. Brichta, of Joplin, project engineer for the Bureau. Brichta also pointed out that possibilities for additional ore reserves of the same type, the formation of which bottoms about the 100-ft. level, were favorable in the area. Prior to his appointment as chief mine inspector by former Governor Forrest C. Donnell in May, 1941, Skinner operated mines at Webb City, Picher, and Waco.

IRON COUNTRY

Necessary exploration under way in Norway-Vulcan area—Lake ore shipments start

★The No. 1 ore dock, at Escanaba, Mich., built by Merritt, Chapman & Scott Co. in 1943 for the U. S. Government, to be used in case the locks at Sault St. Marie were destroyed, is to be sold to the highest bidder. Bids are being asked also for all construction materials, tools, equipment, and wooden buildings at the site. A. B. Sundberg, examiner for the Reconstruction Finance Corp., and G. H. Klemme, engineer for Defense Plant Corp., arrived from Minneapolis to remain until the sales are completed. The government will also sell 18,000 piles driven in the water at No. 3 dock site. The existing Chicago & Northwestern docks at Escabana have ample capacity to handle all iron ore shipped through this port.

★Hjalmer Saari, mine inspector for Gogebic County, Mich., recently issued his report covering fifteen months from Oct. 1, 1943, to Dec. 31, 1944. During this period 4,773,696 gross tons of iron ore was produced by four large operators. Pickands Mather topped the list, employing 816 men at its Newport, Anvil-Palms, Sunday Lake, Ironton, and Plymouth mines. The Oliver Iron Mining Co. has only one producing mine, the Geneva-Davis, which employs

385. The next highest is Oglebay, Norton & Co., with 288, which operates the Eureka mine, near Ramsay, Mich. Republic Steel Co. operates the Penokee group, employing 275 men. During the period covered there were three fatal accidents.

★Penn Iron Co.'s mines, near Norway and Vulcan, Mich., on the Menominee Range, appear to be practically worked out. An intensified search for possible new orebodies is being made with diamond drills. The Conservation Commission of the Legislature, at Lansing, has recommended that appropriations totaling $306,000 be made for exploration. In addition, the State Planning Commission will be asked to petition the Legislature for $100,000 for a topographical survey of the State, to be used for future development of recreation, mineral, and timber reserves.

★The Holmes mine of the Oliver Iron Mining Co. at Ishpeming, Mich., is being dismantled. In the past month all underground cars and haulage locomotives were removed. Two Prescott duplex pumps on the 1,600-ft. level, having a capacity of 700 g.p.m., were also pulled, allowing the level to fill with water. Some of the equipment is being shipped to other mines of the Oliver company, but most of it is being sold to outside parties.

★The Minnesota Senate committee has approved a bill to open the way for building a $30,000,000 plant for concentrating taconite at Babbitt, Minn. The project, previously disclosed by Reserve Mining Co., of Cleveland, would employ 1,000 workers and take several years to complete. It would operate on a year-round basis and have a capacity of 2,500,000 tons. The bill would give the mining company the right of eminent domain and the right to build a dam across the Dunka River to provide the water needed in the plant; also to obtain the lands for pipelines, trackage, sluices, and building sites.

★In its annual report, the Great Northern Iron Ore Properties, which owns iron ore fees and leases on the Mesabi Range, indicated that 10,954,000 tons of iron ore was shipped in 1944, compared with 10,688,000 tons in 1943.

★Vessels of the Great Lakes bulk cargo fleet got under way on April 1 to start the 1945 movement of critical war materials, which is expected to reach a tonnage greater than the all-time record set last year, the Lake Carriers' Association announces. In agreeing to start April 1, the ice committee of the Lake Carriers Association was assured by the U.S. Coast Guard that its huge, new ice breaker "Mackinaw" would be available for opening shipping lanes in spite of windrowed ice blockades, which are said to be heavier than last season at some points. An early start is imperative if the estimated requirements of iron ore, coal, grain, and limestone are to be met.

★Weather permitting, Minnesota iron-mining companies will start on April 1

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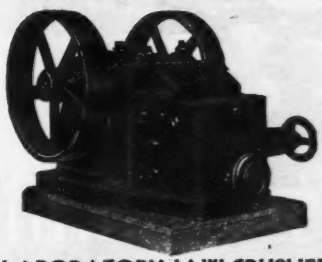
Write today for Bulletin 067 illustrating and describing the above equipment in detail.



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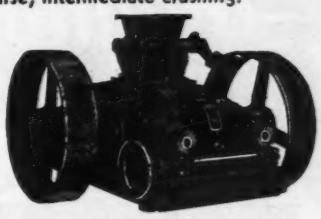

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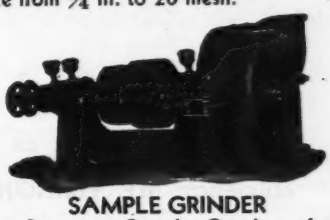
Especially designed for Laboratory Sampling work. Range of output for 8 x 5 size is from ½ in. to 20 mesh and for 10 x 12 size from ¾ in. to 20 mesh.



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Iron Country *(continued)*

to ship the concentrated ore that was stockpiled last season and the underground ore stocked during the winter. Some washing plants are scheduled to start about April 16. Winter stripping and the work of installing new equipment at various beneficiating plants are gradually nearing completion.

★Construction is progressing on the cone unit of Butler Brothers' Patrick plant, at Cooley. R. W. Whitney, general superintendent, has announced also that the area between the Kevin and Snyder mines, both at Cooley, has been named the Olson mine in recognition of the long service of William Olson, pit foreman in the area mentioned. Stripping was started there last fall. At the Carol mine at Nashwauk, the Butler company has one shovel engaged in stripping taconite. Another shovel also may be put on this work. Stripping is to be started immediately on the South Longyear property, north of the Weggum mine, at Hibbing, and operated in conjunction with it.

MICHIGAN

Calumet & Hecla has new secondary copper department; also a new furnace at Hubbell smelter

★The secondary copper business, into which Calumet & Hecla Consolidated has gone on a large scale, is handled by a new department. Material is received either at the smelter or at the leaching plants for classification and handling. The department has smelter facilties open to it and has full possession of the Tamarack leaching plant. Additional equipment will be installed as conditions warrant. At the outset of the war, large quantities of secondary material began to come on the market in the form of gilding metal clad steel. The leaching plant at Lake Linden is treating such material almost exclusively. About the same time, copper oxide from the Tamarack leaching plant became an important factor in producing ship-bottom paint. When the Tamarack deposit of sands ran out, the company purchased secondary copper for making copper oxide. K. S. Williams, of Pittsburgh, formerly with the Copperweld Steel Co., is the new department's first direct representative in the field. He will supervise purchases in the East and endeavor to secure a steady supply of secondary copper.

★Calumet & Hecla's Allouez No. 3 shaft has reached a depth of 1,060 ft. and a plat is being cut at the 9th level. Stoping is under way on the 7th level in the conglomerate drift, which has been driven over 700 ft. from the shaft. The drift on the 8th level is in more than 600 ft., and stoping is under way. The face of the amygdaloid drift on the 8th level is over 480 ft. from the shaft.

★A new Allis-Chalmers 4-in. pump was installed recently in the Lake Linden reclamation plant of Calumet & Hecla. This makes it possible to pump the solution from one tank to another, resulting in a richer mixture and decreasing the amount of distilling formerly necessary.

★Calumet & Hecla has a new furnace in operation at the smelter at Hubbell, replacing the old No. 22 furnace. It is built to meet requirements for supplying billets for the Wolverine Tube division of the company in Detroit, which turns the billets into ammunition, shell bands, and other military products.

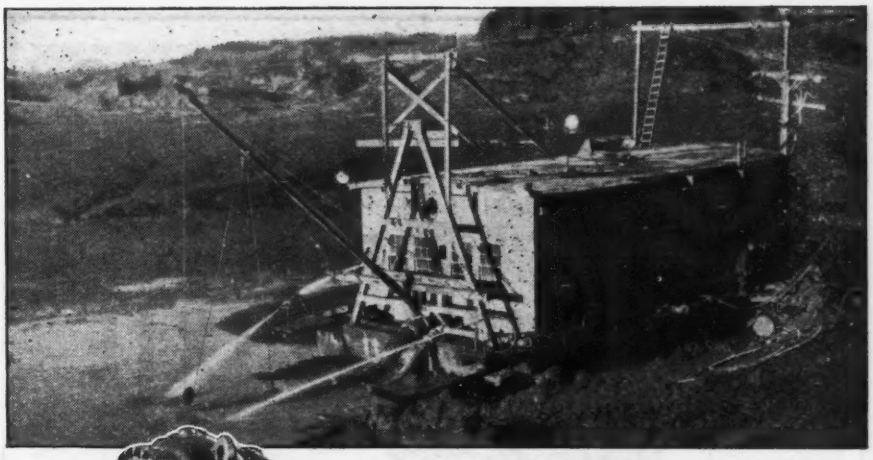
WASHINGTON

Government charges crop damage by Northwest Magnesite and asks for injunction

★The U. S. Geological Survey and Bureau of Mines report a large deposit of alumina clay near Castle Rock, Cowlitz County. The deposit is said to contain 8,000,000 tons of measured ore carrying 30 percent aluminum oxide. In this investigation 67 holes having a total footage of 5,866 ft. were drilled. The presence of an additional 9,249,000 tons of ore with 29 percent available aluminum oxide and 6.3 percent of iron oxide is indicated.

★Two groups of mining enterprises in the Metaline district are consolidating their interests. Pend Oreille Mines & Metals Co. has before it a proposal to purchase all the assets of its subsidiary, Metaline Metals Co., for 105,928 shares of Pend Oreille Mines stock. This will be an equivalent of 10 shares of Metaline Metals for one share of Pend Oreille Mines. Metaline Metals is indebted to Pend Oreille company for more than $84,000. Pend Oreille company will be required to provide capital for the exploration and development of Metaline Metals properties. The two holdings adjoin.

★American Zinc, Lead & Smelting Co. and Metaline Mining & Leasing Co. have settled their legal affairs. The former company will relinquish its 51 percent stock interest in the second company, but Metaline Mining will pay American Zinc a total of $250,000, of which $100,000 is on hand, the rest to be taken out of proceeds from the operations of the Metaline Mining company. H. Louis Schermerhorn, president of the Metaline company, says all differences between the two concerns have been satisfactorily adjusted, and that operations at the mine will continue without interruption. Howard I. Young, of St. Louis, president of American Zinc, was in Spokane while this settlement was being adjusted. Grandview Mines Co., which also has property being operated by Metaline Mining & Leasing Co., reelected H. L. Schermerhorn president and J. S. Ramage secretary-treasurer, both of



One of the Morris 15-inch Type F Dredging Pumps built for the Steep, Rock Project.

Over 1,000,000 cu. yds. of Overburden pumped from Lake Bed in 5 months with

MORRIS TYPE F HEAVY DUTY 15 INCH DREDGING PUMP

Steep Rock Iron Mines, Ltd., has taken initial steps to permit open-pit recovery of iron ore from beneath a wilderness lake by changing the course of a river and draining the lake. Up to 120 feet of overburden is being successfully removed from the ore beds by a 15-inch Morris Dredging Pump, directly driven by a 750 hp. variable speed motor. This pump, installed in a Morris-designed dredge, is provided with 18-inch suction piping and 16-inch discharge piping.

As overburden is removed, and the dredge reaches levels approaching the ore body, a duplicate 15-inch Morris Dredging Pump will be installed in the pipe line as a booster unit. In the meantime this second Morris Pump will be utilized on another dredge.

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Washington (*continued*)

Spokane, at its annual stockholders' meeting in February. Metaline Mining & Leasing Co. also succeeds to the ownership of contracts which have been held by American Zinc under which operations were conducted in ground owned by Sterling Zinc-Lead Co.

★Red Top Mining Co., in northern Stevens County, has received $3,620 from the shipment of 148 tons of ore, which had to be trucked 99 miles to the mill of Deertrail Monitor Mines Co., where it was concentrated. Snow stopped further haulage. The ore produced 10 tons of lead concentrates containing 66 percent lead, and 22 tons of concentrates carrying 57 percent zinc. It cost $6.33 a ton to haul the ore to the Monitor mill and $9 a ton to haul the concentrates to Kellogg, Idaho. After paying freight and treatment, the ore netted $23.75 a ton, according to J. Richard Brown, president and manager. The property is closed temporarily because of inability to get men.

★Due to manpower shortage, Howe Sound Co., operating the Holden mine, in the Cascades, reports its earnings in 1944 were cut to $1.77 a share, compared to $2.80 in 1943. This operation however, included the Britannia, near Vancouver, B. C. At the Holden mine, pending completion of a new shaft late in 1944, production of ore of copper and gold content was limited to what came from development. Premiums for low-grade copper produced above the main haulage level made possible operations at full capacity in 1944 with some profit.

★The federal government has brought suit in the United States court at Spokane against Northwest Magnesite Co., charging that magnesium oxide and other destructive substances from the stacks of the company's plant at Chewelah had damaged the productivity of 620 acres of land held in trust for the use and benefit of heirs of five of its Indian wards. The complaint charges that the government's wards receive less returns from their lands leased on a crop share basis. The government asks damages of $3,840 for crop rental losses from 1940 to 1944 inclusive. The government also asks $11,625 for loss in cash rentals because the land will be in its present unproductive condition for at least five years after cessation of these deposits on the soil. The government also asks injunctions to prevent the continuation of this damaging work.

★Into the confusion and strife which are said to have prevailed throughout the session of the State Legislature, Northwest Mining Association sent several bills, which were passed and sent to the governor for his approval. It is believed Governor Wallgren will sign them. It is confidently expected they will materially aid in the development of mining in the State. Senate Bill 320 amends the existing mine-to-market law and permits the construction of trails in addition to roads. The act is financed by an appropriation of

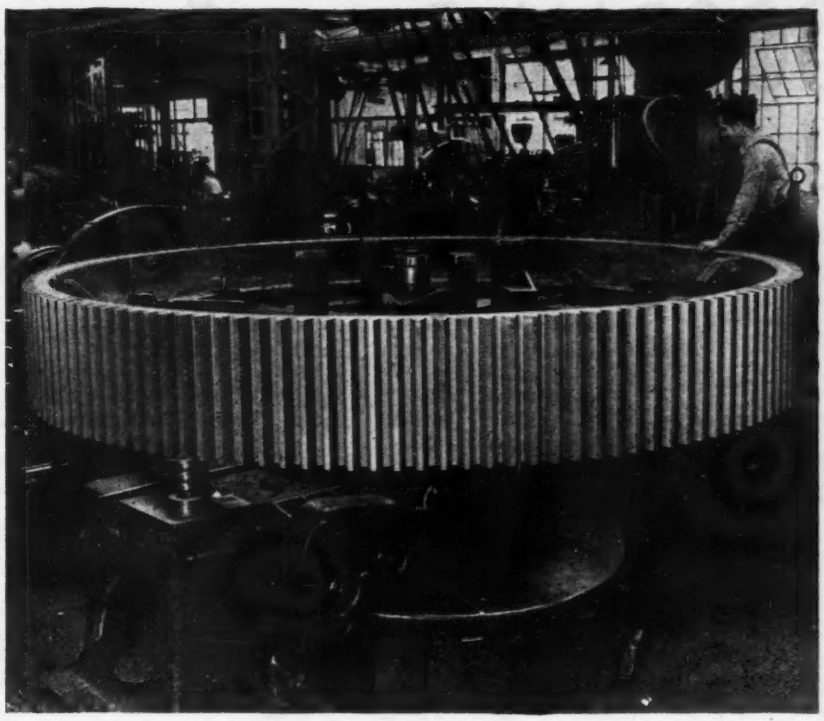
$200,000, 75 percent of which will come out of the State's motor vehicle fund and 25 percent from the county. Substitute House Bill 187 provides for leasing State lands for mining purposes for two years in 80-acre tracts, and for the performance of $50 worth of work annually on each 40 acres. House Bill 147 provides for flat annual corporation license fees for non-producing mines, and for the reinstatement of delinquent mining corporations by payment of back taxes. House Bill 113 provides for the organization of limited partnerships and House Bill 114 is a uniform general partnership law. Senate Bill 173 providing for assessable mining companies passed. Two appropriations of $20,000 each were granted for practical mining instruction in the University of Washington, at Seattle, and the Washington State College, at Pullman. Northwest Mining Association had a strong legislative committee, with Elmer E. Johnston, chairman, which worked diligently for these measures. The West Coast Mineral Association, of Seattle, assisted.

OREGON

Bauxite deposits explored—Silica sand produced near Eugene—Kerby Queen sold

★The Oregon Department of Geology and Mineral Industries has published a report by F. W. Libbey stating that so far as known the State possesses the only bauxite in deposits of commercial size west of the Rocky Mountains. They are located within 25 or 30 miles of aluminum reduction plants at Vancouver, Wash., and Troutdale. This makes them a potential source of alumina, which now must be hauled from St. Louis or Mobile. This, he says, may be the determining factor in producing the cheapest aluminum in the country. Sixty-three augur holes were put down, and some pick-and-shovel work has been done in exploring these deposits, which are in four townships in northern Washington County. Similar exploration has been done on deposits in Columbia County. The deposits in the two counties are easily reached from Portland by roads, mostly paved. These deposits are flat, lying under an overburden of silt from a few inches to 40 ft. thick. The ore averages about 11 ft. thick. It varies in color from yellow to brown, and is both hard and soft. Work in the Hendrickson locality has indicated over 2,000,000 long tons of material which analyzes alumina 32 percent; iron oxide 26 percent; silica 9; phosphorus 0.14; titania 4.5; moisture 19; ignition loss 18.

★Owen Jones announces the purchase of the Kerby Queen copper property from George Clark, of Grants Pass. The property is west of Cave Junction near Hanieford Gulch, 43 miles from Grants Pass. Purchase price was not given. Production from the upper



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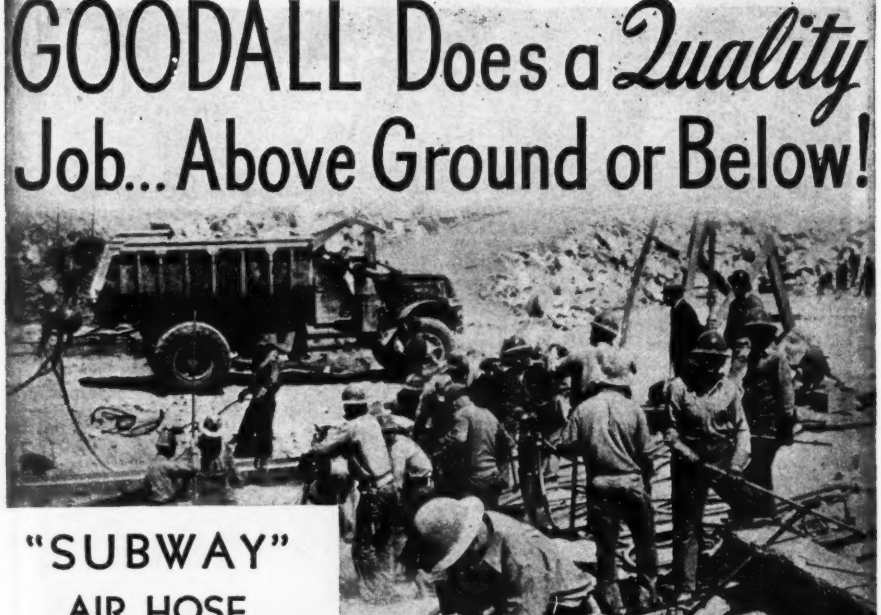

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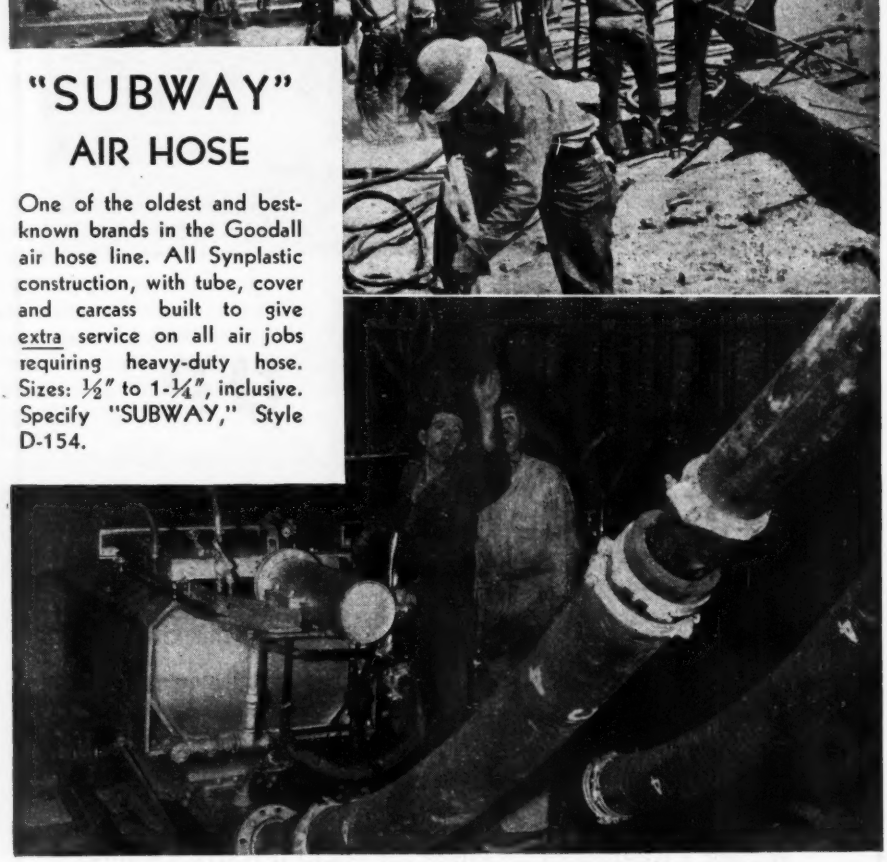

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Oregon (*continued*)

levels of the mine was about 3,000 tons between 1900 and 1905. A 700-ft. tunnel has been run about 500 ft. below the old workings. Shipments will be made direct to the Tacoma smelter. Mr. Jones also owns the Mammoth mine, on Mule Creek; the Cash Entry mine, near Roseburg; and an interest in the Gold Plate on Evans Creek.

ALASKA

Miners ask lower prices on surplus equipment—Requests to mine gold will clear through Commissioner of Mines office

★Alaska Miners Association, meeting in Seattle, appointed a committee comprising J. K. Crowdy, John Ogre, and Alex Matheson, to request the RFC to modify the regulation covering the sale of surplus government equipment in Alaska. It was claimed ceiling prices on this equipment are too high considering the condition of much of the material.

★Ohio Mining Co. has been drilling on Ohio Creek, and it is reported that some gold was found in the seventh hole at a depth of 170 ft. The next hole is to be drilled 185 ft. at a point 250 ft. from the last one. Other holes have been from 106 to 170 ft. deep. Ed. Farrell, who has done the work, reports that the operations are in the channel and that better results may be expected in the future.

★Larry Doheny, in charge of the placer mining classes for the University of Alaska, started with 29 enrolled and increased to about 45. Four of the students are taking the course for university credits. Thirteen mining engineers and several experienced prospectors are on the "faculty." Frozen and thawed drilling are compared and all phases of placer mining are studied, including stripping and blocking out. "There are no adequate textbooks on placer mining and knowledge comes from exchanging information," Doheny says. "Many big companies have been reluctant to give publicity to their methods of operation." John Ryan, an accredited mining engineer, has started a course of 15 lectures on mining at the Anchorage High School. He reports that 327 men and women, including soldiers and civilians, signed the rollcall.

★Leo H. Saarela, purchasing agent for Metals Reserve Co., reports the company purchased $103,000 worth of high-grade chrome ore and mercury metal at Anchorage last year. The chrome came from the Red Mountain area near Seldovia and amounted to over 1,600 long tons. The mercury came from Sleetmute, and amounted to 211 flasks. He reported that in two and a half years producers of those metals were paid $296,000.

★The tax committee of the Alaska Miners Association has recommended to the Legislature (1) the abolishment of the present gross tax on mining and a substitution of a net tax on profits; (2) a substantial tax exemption to new mines for the first few years; and (3) special tax relief for those gold mines which have suffered hardship due to WPB order L-208. At a recent meeting of the association, Charles Johnston, president, gave a review of the income tax bill before the Legislature. He said the bill would levy an income tax on miners in addition to the gold tax, and would allow a depletion deduction.

★War Production Board has ordered that requests for permission to mine gold in Alaska are to be filed with B. D. Stewart, Commissioner of Mines for the Territory. He has been granted authority to handle appeals for relief from the provisions of L-208. All such appeals hereafter must be accompanied by form WPB-3820, on which information required by the War Manpower Commission is to be recorded. Under this new arrangement clearing of appeals will be done by officials familiar with Alaska mining.

★The Territorial Legislature has passed a joint memorial asking for a congressional investigation of the land withdrawal policy in Alaska by the Secretary of the Interior. The Legislature also passed Joint Memorial No. 8, asking Congress to allow Alaskans to elect their own governor.

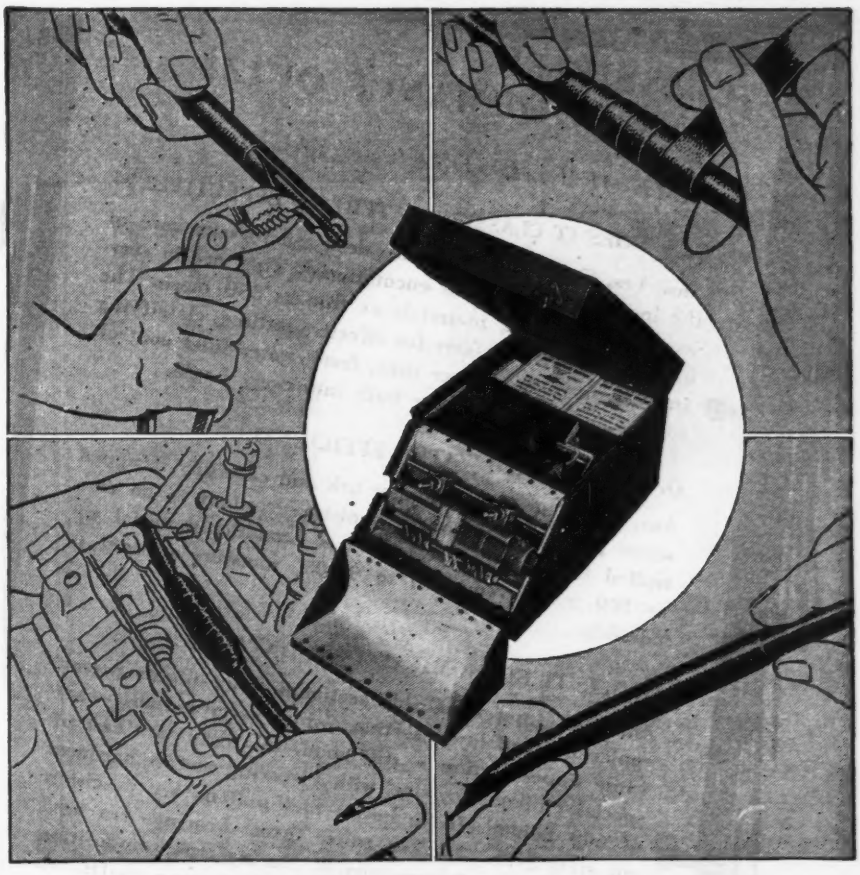
★A mining deal was closed about the first of March in Fairbanks by Mike Erceg and Val Diebold. Mr. Erceg paid cash for claims 22, 23, and 24 below Association on Goldstream Creek. This property joins the George Gartner estate, of which Mr. Erceg is guardian. This area has been drilled by Mr. Erceg and both units of ground will be mined by dragline after the war.

★The two producing mercury mines in the central Kuskokwim district are preparing to operate again this summer. Harold Schmidt, of Fairbanks, who is associated with the Gould interests in the Sleetmute property, has a crew deepening the shaft and conditioning the rotary kiln. Retorting is expected to start about May first. Robert Lyman, who operates the De Coursey Mountain property, about 28 miles from Crooked Creek, a small village on the Kuskokwim, is now hauling wood for the 1-ton retort and expects to operate all summer.

CANADA

Postwar outlook for gold mining best in history of the Dominion—Drilling reveals extensive deposits

★Early in March a statement issued by C. D. Howe, Minister of Munitions and Reconstruction, at Ottawa, and Cana-



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Canada *(continued)*

dian representative on the Combined Production and Resources Board, at Washington, referred to construction projects at Arvida, Quebec. These were undertaken to relieve unemployment following cutbacks in the production of aluminum. A. A. Mackay, president of the Canadian Institute of Mining and Metallurgy, has been appointed co-ordinator of resources development, under the recently organized Reconstruction Department. Public projects are being studied by the provinces and municipalities. Mr. Howe's department will co-ordinate plans proposed and advise on the basis of urgency and responsibility. Mining camps, under this policy, will be reorganized as areas ready to absorb an important percentage of available labor. The defeat of Germany is to be followed by a reduction in war output from three to two billion dollars a year. No employment problem is expected in Canada until after the defeat of Japan.

QUEBEC

★Elder Gold Mines continues to extend the No. 1 ore zone to a length of 1,250 ft. by diamond drilling. A maximum incline depth of 1,000 ft. has been indicated. A. H. Honsberger, consulting engineer, estimates 275,000 tons of indicated ore as a result of the first 67 drill holes. No. 1 zone has been extended another 200 ft. by holes Nos. 68 and 70, which returned core assaying $4.32 to $5.78 in gold per ton across widths ranging from 7.5 to 17 ft.

★In February, an agreement was signed by Noranda Mines and Local 688, United Mine, Mill and Smelter Workers Union (CIO). The company recognizes the union as the sole bargaining agency for all hourly rated employees, with certain exceptions, but retains the right to hire and fire, subject to "grievance procedure." Union membership or non-membership will not be recognized as reason for discrimination against any hourly-rated employee and no person is to be required to join a union as a condition of employment at the mine. No solicitation of membership, collection of union dues, or grievance work will be permitted on the company's time. The scale of wages remains unchanged and there is no provision for "check-off" or closed shop. The agreement is described as the first of its kind in the Quebec non-ferrous mining industry.

★J. P. Norrie, president of Croinor Pershing Mines, reports that drill exploration of three veins has indicated a large tonnage of good-grade ore. A mining plant is being erected in preparation for shaft sinking after present government restrictions on underground development have been lifted. Ore widths vary from 3 to 35 ft. and lengths have been explored from 300 to 850 ft. The ore estimate shows 1,200 tons per vertical foot averaging $7 per ton in gold. Croinor is credited with the original gold discovery of commercial proportions in Pershing Township,

although some ten years ago Fred Thompson made a promising discovery in this area.

★Production in 1944 at four Quebec properties controlled by Ventures, Ltd., has been given in an interim report by the president, Thayer Lindsley. Gross income from zinc-lead-silver-gold ore of New Calumet Mines, since the 500-ton concentrator started in October 1943, amounted to $1,385,797. Revenue from Waite Amulet Mines representing ore mined from the property of Lake Dufault Mines was reduced to $132,000 (in 1943, $198,000). Gross income from Beattie Gold Mines was also reduced, from $1,017,978 in 1943 to $506,369 in 1944. At Canadian Malartic Gold Mines, production was valued at $1,387,918 compared with $1,239,477 in 1943. Ventures received revenue from three other gold producers, including La Luz, in Nicaragua, and ten properties that have been producing strategic minerals as a contribution to the war effort.

ONTARIO

★Falconbridge Nickel Mines, in the Sudbury district, is the main Ventures-controlled operation. J. Gordon Hardy, president, reports operations in 1944 at a rate exeeding any other year in the company's history. This has been possible in spite of labor shortages through increased mechanization and improved metallurgy. Ore-dressing plant, mill, and smelter operated without interruption and metal loss was reduced to a record level. Tonnage, at 830,254, was almost 3 percent above the volume treated in 1943, with output of 12,048 tons of nickel and 6,382 tons of copper in matte. Grade of ore was reduced slightly, due to the restricting of mining to the eastern low-grade edges of the orebody. Satisfactory ore is being developed at 2,625 and 2,800 ft.

★At the annual meeting of Kirkland Lake Gold Mines, the managing director, V. H. Emery, reported probable ore between the 4,300 and 5,450-ft. levels amounting to 405,186 tons, valued at $5,249,910. Development since the first of the year has opened sections of good grade in No. 4 and No. 5 veins on the 38, 44, and 46 levels.

★Teck-Hughes Gold Mines continues at a reduced mill rate, treating ore hoisted through the south shaft from the block between the 10 and 15 levels. As clean-up operations advance, the grade has been improved by opening branch veins and remnants of old orebodies containing good values. The central shaft is being repaired to allow extension of this program below the 20 level. The search for subsidiary ore in branch veins is being continued, with careful attention to the hanging-wall portions of the ore zone. It is reported that a search for new ore will be undertaken below the 20 level when shaft rehabilitation has been completed. Ore reserves amounted to 285,478 tons averaging $13.32 in gold per ton at the end of 1944.

★Deepening the No. 2 shaft is in

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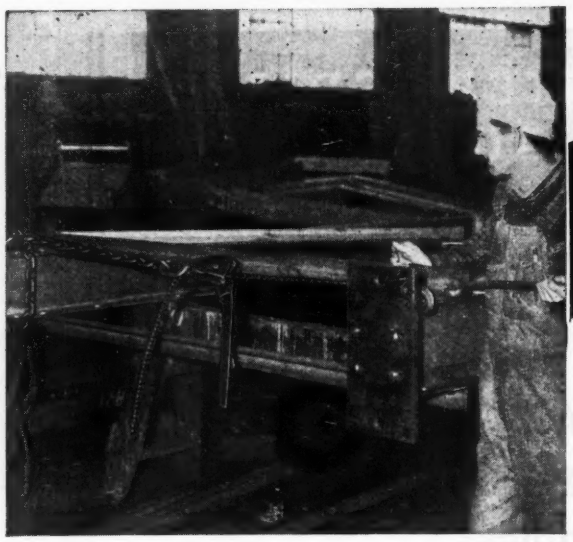

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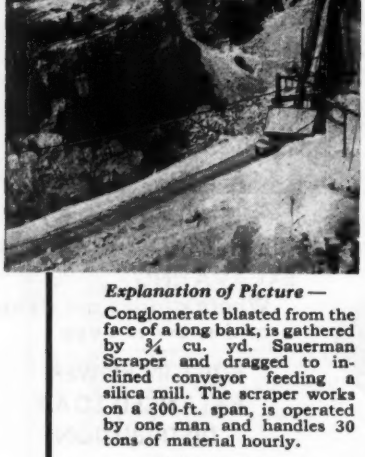

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Canada (*continued*)

progress at Upper Canada Mines. In March, the shaft had been extended from 750 to 900 ft. and was being continued down to 1,250 ft. to open four new levels. At the 1,000-ft. horizon a 2,900-ft. drift will be opened to connect this with the No. 1 shaft, which is 1,750 ft. in depth. The project, including a series of exploratory drill holes to be put out from the long drift, is to be completed within the next two years. The wide zone in the No. 2 area was found in recent exploration to consist of two orebodies having a combined width of 23 ft. and the grade about mine average. The "M" zone is being explored by drill and drifting from the No. 1 shaft on the 1,000-ft. level. In recent months, the mill rate has been held at about 200 tons a day.

BRITISH COLUMBIA

★The Hon. E. C. Carson, Minister of Mines and Trade and Industry, in a report to the Legislative Assembly on March 6 predicted a gold-mining boom in British Columbia in the early post-war period. He said that despite the shortage of skilled labor and technical experts, and governmental limitations on the amount and type of work to be done on such properties, intense interest was manifested by established British Columbia mining companies and by eastern Canada and United States investors.

★C. M. Campbell, safety engineer of the Mining Association of British Columbia, in his report on employment in metal mines in this Province, states that only 93,224 shifts were worked in February 1945, compared with 178,815 in the basic month of January 1942. Shifts worked in gold mines were 29,983, compared with 84,389 in the basic month, a loss of 65 percent. In the Province's lone silver mine, the Highland-Bell, 626 shifts were worked, compared with 1,033. In the copper mines, Britannia and Copper Mountain show 20,749 shifts, against 43,357 three years ago, a net loss of 58 percent. In a group including silver, lead, zinc, tungsten, and mercury, the decrease is less marked: 41,866 shifts compared with 50,030.

★Silbak Premier Mines, Ltd., Portland Canal mining division, obtained net smelter returns of $46,133 from February production, recovered after treatment of 5,481 tons of ore, averaging 0.22 oz. gold and 1.75 oz. silver per ton. Operating loss was $3,300.

★Cangold Mining & Exploration Co., Ltd., has been formed to undertake further development of, and bring into production, the Sherwood mine, in Strathcona Park, Vancouver island. More than $30,000 is now in the treasury, and this is considered ample for initial exploration. Some work was done on the property by Pioneer Gold Mines of B. C., Ltd., and indicated ore reserves are estimated at 27,830 tons, averaging 0.5 oz. gold per ton. Managing Director Gayer, graduate of the

Colorado School of Mines and recently general superintendent of Twin "J" Mines, Ltd., reports that the company intends to conduct a full-scale exploration program during the summer of 1945. Three levels have been opened to date.

★Santiago Mines, Ltd., has let a contract for diamond drilling on the Venus and Venus Fraction mineral claims on Lasqueti island, Nanaimo mining division. At a later date it is intended to drill property adjoining that of Vananda Mining Co., Ltd., on Texada Island. Santiago has also acquired title to the well-known Bosun mine, Slocan mining division, and has projected a program of development with a view to reviving production of base-metal ores.

★Bralorne Mines, Ltd., Lillooet mining division, has acquired control of Taylor (Bridge River) Mines, Ltd. On Feb. 21, shareholders of the Taylor company approved sale of the 1,014,701 shares remaining in the treasury to the Bralorne company. This represented slightly more than one-third of the 3,000,000 shares. However, Bralorne reserved the right to purchase further stock, either privately or in the market, and early in March had acquired close to a million shares more, giving it undisputed control. The Taylor property adjoins Bralorne on the north and east, and in 1934 and 1935 was subjected to development from the eighth and tenth levels of the old King mine. The popular conviction that the highly productive veins of the King mine dip into Taylor ground, and encouraging development on Bralorne's 20th level more than 900 ft. below the lowest previous work in this section, have given the Taylor property an added significance in Bralorne's program of expansion. Development of the Taylor mine will be resumed as soon as sufficient men are available.

★G. S. Eldridge, president, Olympic Gold Mines, Ltd., reports that a contract has been let for diamond drilling on its property, situated across the Bridge River from the Minto mine. Prior to the suspension of surface work some years ago promising veins had been discovered, and the present work is designed to determine their persistence at depth.

★New funds have been secured by Pilot Gold Mines, Ltd., with which to resume development of the company's property on Gun Lake, Lillooet mining division. A diamond-drilling contract has been let.

★Island Mountain Mines Co., Ltd., Cariboo mining division, during February produced 911 oz. gold, valued at $35,058, from 2,000 tons, averaging 0.455 oz. gold per ton. During the fiscal year ending Dec. 31, 1944, production was 9,441 oz. gold and 1,438 oz. silver, valued at $363,948, from 21,186 tons, averaging 0.46 oz. gold per ton.

★Pioneer Gold Mines of B. C., Ltd., has granted a 20 percent interest in the development of the Harrison group of mineral claims at Whitesail Lake,

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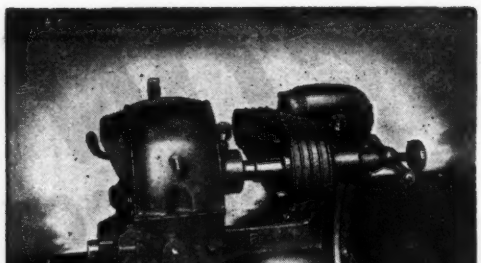

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Canada (*continued*)

Omineca mining division, to Premier Gold Mining Co., Ltd. A quartz vein discovered on this property last July gave assays averaging 0.35 oz. gold and 10.0 oz. silver per ton over a width of 6 ft. for a length of more than 1,500 ft. as indicated by outcrops and surface stripping. In the rush of prospectors and field engineers to the district following news of the discovery, Premier staked ground adjoining Pioneer's claims.

★Shareholders of Sheep Creek Gold Mines, Ltd., Nelson mining division, have been advised that the regular quarterly dividend of 3c. per share will be paid April 16 to those of record March 31. During recent years the dividend has been earned more through the subsidiary mining of lead and zinc at Zincton, in the Slocan mining division, than by operation of the Sheep Creek gold mine, which has been grossly undermanned.

★During the period from June, when milling was resumed, to the end of 1944, Base Metals Mining Corp., Ltd., Golden mining division, treated 24,899 tons of ore, averaging 2.60 percent lead and 14.12 percent zinc. Production aggregated 594 tons of lead concentrate averaging 78.51 percent lead and 17.21 oz. silver per ton, and 5,101 tons of zinc concentrate averaging 58.89 percent zinc. Estimated operating profit was $66,000.

★Correction.—In the February number of *E.&M.J.* it was erroneously stated on page 178 that "Western Exploration Co., Ltd. . . . has purchased the Enterprise mine from the liquidator of Ymir Yankee Girl Gold Mines, Ltd." E. P. Crawford, president of Ymir Yankee Girl Gold Mines, Ltd., informs us that his company "is not in liquidation, but very much alive; moreover it never had anything to do with the Enterprise mine. Presumably our correspondent meant Yankee Girl Consolidated Co., which has been in liquidation for some years but has never had any connection with Ymir Yankee Girl Gold Mines, Ltd., except a similarity of part of the name." The editors of *E.&M.J.* regret the error and gladly make the correction.

MANITOBA

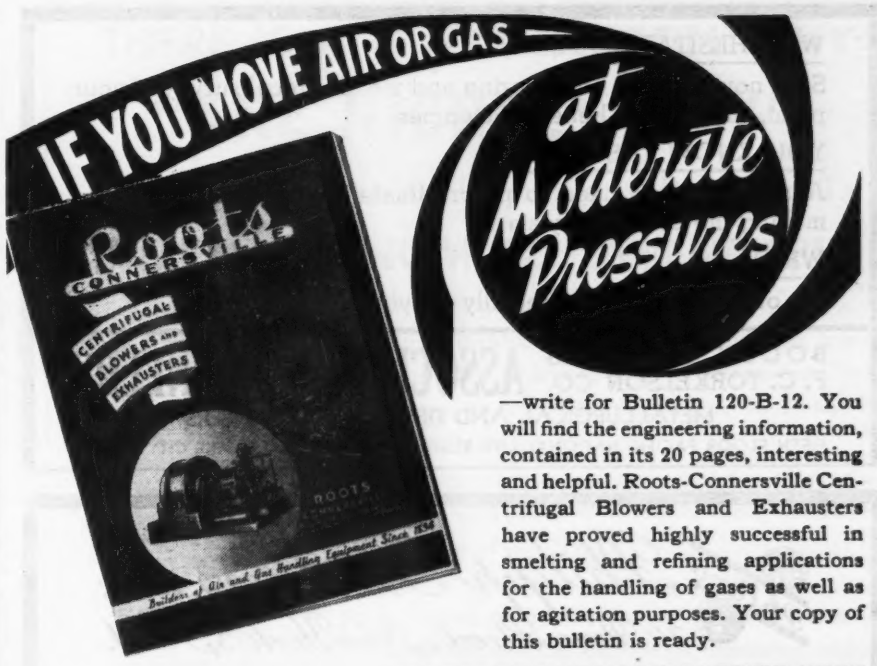
★Total value of Manitoba mineral production in 1944 was estimated by the Dominion Bureau of Statistics at $13,726,436, a slight increase over 1943, which totaled $13,412,266. Gold production was lower in 1944, but the loss was more than offset by increases in the value of base metals and structural materials. Details of the estimate for 1944 follow: Gold, $2,874,602; silver, $284,614; copper, $5,233,008; zinc, $1,906,208; cadmium, $22,711; selenium, $50,544; tellurium, $6,300; nonmetallics, $3,348,449.

★The region north of The Pas between Flin Flon and Herb Lake is attracting increasing attention as a promising area for the development of new mines, particularly in the vicinity of the large

orebody located by Howe Sound Exploration Co. at Snow Lake. Gold is the principal attraction. Several well-known mining companies have prospectors and exploration staffs in the field, and others are preparing to enter the area within the next few months. Northern Canada Mines and Pioneer Gold Mines of B.C. jointly hold a number of claims on which they have three gold showings under examination. Drilling from the lake ice commenced early this year on one of these showings, at Three House Lake, where prospectors took samples from the lake bottom last summer. No results have been reported. Drilling on the second showing, at Morgan Lake, commenced in mid-February. At this place surface sampling on an island in the lake indicated two sections totaling 450 ft. in length reported to average 0.77 oz. gold over 2.3-ft. width, with the south end still strong and rich where it goes under the lake water. A geophysical survey is being conducted on the third showing, in an endeavor to locate the source of large pieces of mineralized float which occur in several places in a long depression. Because of their location, the boulders are believed to have come from the immediate neighborhood, but the ground is too wet for trenching. Dr. Neil Beaton and Dr. Gordon Crombie are doing the geophysical work, and Alex. Mosher is in charge of diamond drilling. Consolidated Mining & Smelting Co. is prospecting a group of claims in the vicinity of Snow Lake, and is planning an extensive campaign of exploration in other parts of the area. Neeley Moore is the engineer in charge. International Mining Corporation (Canada) is also exploring several groups of claims adjacent to Snow Lake and has found some interesting surface showings. Exploration is directed by Dr. Greer.

★Wekusko Consolidated, an exploration company financed by God's Lake Gold Mines, Frobisher Exploration, Nipissing Mines Co., Moneta Porcupine Mines, Sherritt Gordon Mines, and Ventures Ltd., has optioned several older known occurrences around Herb Lake for further examination, and is interested in a block of claims at Reed Lake. It is reported that 10,000 ft. of diamond drilling completed in the latter part of 1944 on the Rainbow-Ferro group on the east side of Herb Lake indicated an oreshoot 250 ft. in length, averaging approximately 0.26 oz. per ton across an average width of 8.2 ft. This new oreshoot lies 300 ft. northeast of an orebody on which underground exploration was carried out by former operators. On the 150-ft. level this orebody was 153 ft. long and averaged approximately 0.28 oz. over 4.1 ft. The results obtained are considered to justify resumption of underground exploration when the necessary permission can be obtained. Drilling of a group of claims at Squall Lake, due north of Snow Lake, has recently been commenced. R. J. Jowsey is president of Wekusko Consolidated and W. Brock Tribble is in charge of exploration.

★To complicate the situation, two com-



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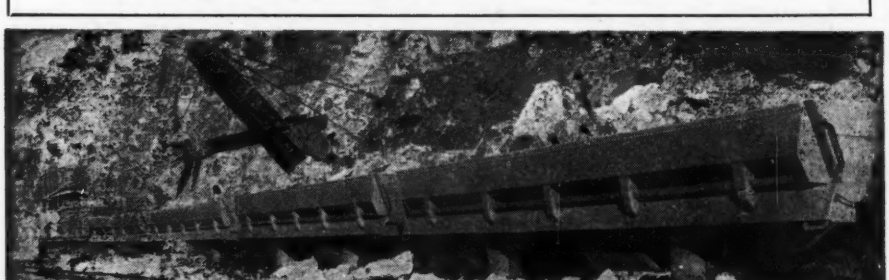

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Canada *(continued)*

panies with the name of Snow Lake Gold Mines, Ltd., have been formed; one of them was incorporated in the province of Ontario with John Nutt as president; the other in the state of Delaware. Both companies are exploring groups of claims adjacent to the Howe Sound Exploration Co.'s property at Snow Lake.

★Further to the west, Sherritt Gordon Mines Ltd. is exploring two gold occurrences discovered last year in the vicinity of Neso and Nisto Lakes east of Cranberry Portage, and Hudson Bay Mining & Smelting Co. Ltd. is drilling the Amulet group of claims and the Copper Reef property, both near Lake Athapapuskow.

★On Feb. 14 and 15 in Flin Flon a ballot was held by the Wartime Labor Relations Board, for certification of a bargaining agency for the employees of the Hudson Bay Mining & Smelting Co., Ltd. It was a straight vote between the United Mine, Mill & Smelter Workers, a CIO affiliate, and affiliates of the American Federation of Labor. The craft unions won with a substantial majority, the CIO union being defeated in all departments.

MEXICO

Labor and supply problems affect operation of many companies in all districts

★Spring found mining in Mexico doing only fairly well, a circumstance due largely to uncertainty about renewal by Metals Reserve of 1945 contracts for strategic metals and minerals. This business is practically the life blood of Mexican mining. The uncertainty has prompted some deferment of new projects and the slowing down of established works. Both the industry, employers and labor, and the government, are concerned with plans intended to be a buffer for the mining business in the postwar period. Labor, rather a chronic problem for mining in Mexico, has been comparatively quiet for some time.

★Representatives of the Dos Carlos mining cooperative society, Pachuca, Hidalgo, Mexico's pioneer enterprise of the kind, organized by the Cardenas government in June, 1937, have denied a story published in *Excelsior*, Mexico City daily, that the condition of the rank and file of the society's members is deplorable. *Excelsior* said the cooperative pays its peones only 2.90 pesos (59c.) a day and that many of the members have silicosis. The representatives declared that the society sustains more than 3,000 members and their families and while some of the members may have silicosis, that is not an alarming circumstance because, they aver, that disease is rather common among miners. The representatives also denied the charge that the cooperative's

leaders "live like princes," saying they get much less than other mining leaders.

★The Santa Fe mining cooperative society, Guanajuato City, has had labor trouble, short sitdown strikes, that hampered its operations. The strikes were the members' protest against slowness in meeting payrolls by the cooperative's administrative committee.

★Some mining enterprises of the Pachuca, Hidalgo, sector are experiencing a labor shortage, according to reports from the silver center, because of a vertiable trek of much of their help to seek places in consignments of farm and railroad laborers that Mexico is sending to the U.S. in accordance with the manpower agreement between the governments of the two countries.

★Mining activities have been revived in the Lampazos district, Nuevo Leon, with explorations for deposits of gold, silver, and some of the more wanted industrial minerals by a company recently organized by Carlos and Lorenzo Gonzalez Garcia, Roberto Rodriguez Fuentes, Arturo Gonzales Ramos, and Basilio de Leon, prominent Nuevo Leon and Coahuila mining and businessmen.

★Peon shortage is said to have obliged the San Luis Mining Co., Tayoltita, Durango, to offer the exceptionally high wage in Mexican mining of seven pesos ($1.46) per eight-hour shift for this class of labor.

★The National Commission for Stimulation of the Mining Industry reports that its ore-treatment plant at Altar, Sonora, has proved of great benefit to mines in a large area of northwest Mexico, particularly in the Guadalupe, La Republicana, Cerro Prieto, San Jose, Pozo Prieto, San Felix, La Cuchilla, El Plomo, and Santa Felicitas zones. In four and one-half years of operation the plant treated 3,806 tons of ore containing an average of 24.6 grams gold and 145.5 grams silver per ton. The plant represents an investment of $14,746. Preparations are under way to add cyaniding facilities, which the commission expects will insure higher recoveries of gold and silver at lower costs.

★President Manuel Avila Camacho has decreed that strategic metals and minerals, as well as coke intended exclusively for the mining-metallurgical industry, must be exempt from whatever freight rate increases are allowed Mexico's four major railroads next year. They have been allowed to petition for freight rate increases before the end of 1945. If allowed by the Ministry of Communications and Public Works, they will become effective Jan. 1, 1946.

★J. Lowenstein, an official of Potosi Mining, Chihuahua, has warned the Labor Ministry that unless his company can be assured sustained and ample supplies of oil fuel it will be obliged to suspend operations. The company has about 3,000 employees. The Ministry has appealed to Petroleos Mexicanos, the official oil company, and the National Railways to correct this situa-

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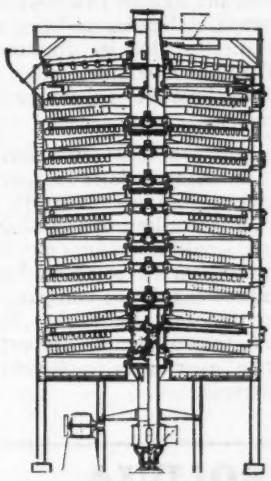

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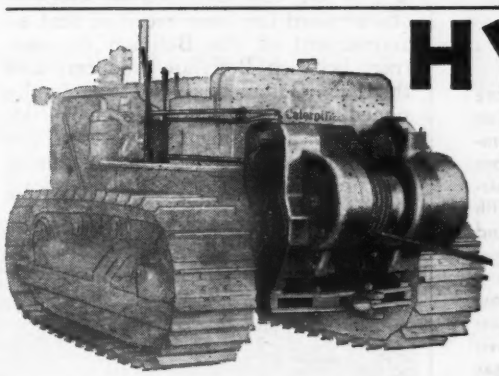

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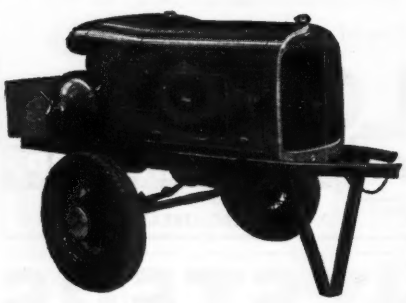

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Mexico (*continued*)

tion. Fuel oil supplies to other mining enterprises have improved considerably of late, as the National Railways has bettered its freight service by reconditioning rights-of-way and operating more cars and locomotives. However, complaint has been made by Peñoles that the lack of sufficient freight cars has given it a burdensome stockpile of 30,000 tons of ore at San Francisco del Oro, Chihuahua. Peñoles said this ore is urgently needed by its treatment plant at Torreon, Coahuila, and that slow deliveries threaten to decrease the plant's operations.

★Lack of raw materials has forced closure of Cia. Minera de Huazapares, S.A., Chihuahua, and has made idle its 500 employees, according to section No. 117 of the national miners union. The Labor Ministry is endeavoring to obtain raw materials to enable the company to resume and maintain its work. It is reported that the company's properties may be turned over to its employees to run cooperatively.

BOLIVIA

New tin contract signed—Tungsten mines suffer from contract cancellation

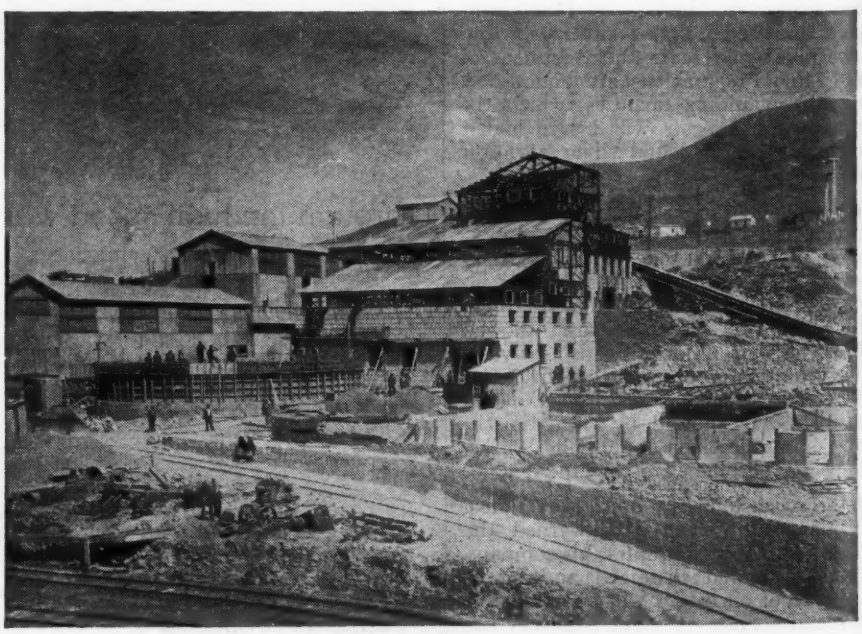
★After long and laborious negotiations, official word has been received that an amendment of the Bolivian tin contract between Bolivian producers and the U.S. Commercial Co. was finally signed in Washington on March 3, 1945. This new amendment involves a few modifications intended to "maximize the production of tin . . . " "taking into account the interests of the respective governments, the workers, and the producers."

★The outstanding features of the amendment are: (1) Basic price raised from 60¢ per pound of fine tin to 62¢ for the concentrates delivered to the United States between July 1, 1944, and Dec. 18, 1944, with deductions for treatment charges, smelting losses and penalties for impurities, in accordance with the 1940 original contract. Soluble tin paid for up to 22.4 lb. per ton of concentrates. (2) Basic price raised to 63½¢ per pound of fine tin delivered between Dec. 19, 1944, and June 30, 1945, the date on which the contract expired. Soluble tin paid for up to 1 percent of total tin content. (3) For this latter period there are new deduction tariffs, in general higher than those of the 1940 contract, especially for concentrates below 35 percent Sn. Against these increased charges, the seller is credited with 1.5¢ per pound of tin. (4) The Bolivian government gives "assurances to the United States government that it does not intend to impose or encourage the imposition of any additional or increased taxes or other charges which would tend to reduce or impede production." Failure to comply with this clause would justify cancellation of the amendment.

★Mineral exports for 1944 are given below in metric tons of metal.

Tin	39,341
Zinc	16,319
Sulphur	6,146
Lead	9,047
Antimony	7,448
Copper	6,170
Tungsten (WO_3)	4,761
Silver	211
Asbestos	13
Mica	2

There also were exported some small



Sink-and-Float plant during construction at tin concentrator of Patiño Mines & Enterprises at Catavi, Llallagua, Bolivia. The mill is now in operation, with a rated capacity of 5,500 tons in 24 hr.

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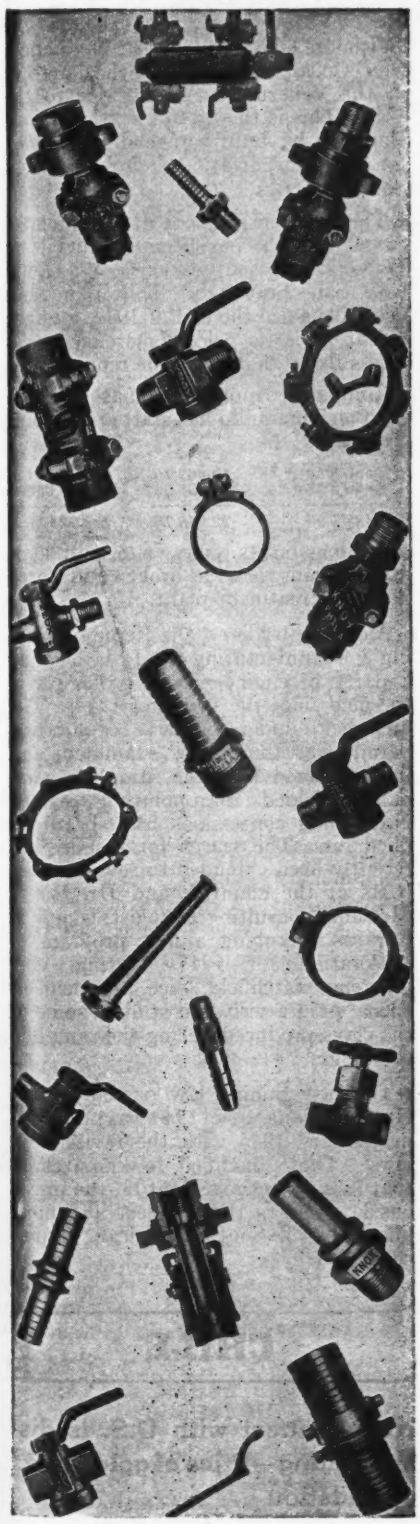

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amounts of mercury, gold, and bismuth. All the metallic gold produced, for which complete figures are not available, was sold to Banco Central de Bolivia and remained in Bolivia or was smuggled to countries where the price is higher. Production probably did not amount to more than 200 kg. The export figures also represent closely the production, since practically all the ores and concentrates produced are exported for refining to the United States or England. Exports for 1943 in metric tons of metal for the main Bolivian products were as follows: Tin, 40,959; tungsten (WO_3), 4,141; antimony, 17,973.

★Because of increasing costs of production and lower prices for tungsten, the Chojlla mine, an important producer, and several smaller properties have shut down. Since cancellation of Metals Reserve's contract on June 30, 1944, nearly all tungsten mines have done no development work and are now mining out such developed ore as is still of commercial value. It is expected that in 1945 tungsten production will fall sharply in spite of the lowering of export taxes.

★Some small tin mines have also shut down lately, like Kami and Japo of Bolivian Tin & Tungsten Co., of the Patiño group, and Morococala, Alantana, and others of the Hochschild group.

VENEZUELA

Gold mining suffering from curtailed development—New mining code published

★The gold mines in the State of Bolivar are suffering the full effects of curtailed development work resulting from the lack of equipment due to wartime restrictions on exports from the United States and Great Britain. During 1944 there was a further fall in the amount of gold produced, as the following table shows:

	Grams
1942	3,607,599
1943	2,570,208
1944	2,417,250

Since 1940, the peak year, gold production has fallen off by nearly 50 percent, and it is expected that during 1945 it will show a further reduction.

★New Goldfields of Venezuela, Ltd., reported a loss of £12,000 for the fiscal year July 1943 to June 1944. The tonnage milled was 107,000, compared with 220,868 two years ago. Development footage was unavoidably cut from 12,000 to 400 during the above fiscal periods. The grade of the ore since the last quarter of 1944 has fallen off and the company is now operating at a considerable loss.

★Compañia Francesa de la Mocupia is also facing a crisis for the same reasons, and early in March was negotiating a lease of its Columbia XI concession to

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Venezuela (*continued*)

the New Goldfields of Venezuela, Ltd. The former company has for the past two years produced about 2,000 tons of ore per month averaging 17 dwt. per ton. The completion of an inclined shaft and auxiliary works resulted in a reduction of underground transportation costs, but the unavoidable reduction of development work has now resulted in almost complete exhaustion of the ore blocked out during 1940–1942.

★Other gold-mining activities have been insignificant during 1944, but the Caracas press reported during February 1945 a rich find of gold in the Manteco region, in the State of Bolivar. The report that 10,000 oz. of gold was taken out in the first few days of the rush to this area appears to be exaggerated.

★Output of diamonds also declined during 1944, as indicated below:

	1942	1943	1944
Gran Sabana (Surukun)	25,675.37	19,460.70	16,691.62
Lower Caroni River	8,372.58	3,385.06	5,345.45
Total output, carats	34,047.95	22,845.76	22,037.07

The reduction in output from the Gran Sabana field was due mainly to the steadily increasing cost of living in this remote region and to a reported lowering of prices paid by diamond buyers. As a result some miners moved to the Lower Caroni field, where living conditions are better and supplies are cheaper. On balance, the output of diamonds, by caratage, was only slightly below that of 1943. The prospects for 1945 are somewhat clouded by the closing of the F.E.A.'s diamond purchasing department in Caracas.

★No diamonds were purchased by the U. S. government's agent after Jan. 3, 1945, and Leon Eskenazi, the official buyer, left for Washington early in February. The miners fear that the diamond buyers in the field will now lower prices for the rough stones, and the tendency for the miners to migrate to other areas may be accentuated. That this fear is not without foundation is illustrated by one particularly bad case in which a miner was offered Bs1,000 for a 19-carat stone that was later sold to a Caracas diamond buyer for Bs6,000.

★International Nickel Co. has a party in the field headed by Dr. Arthur B. Yates, chief geologist, and Al. Elves, chief engineer. An option has been acquired over the best of the known nickeliferous areas and sampling work is being systematically done by pitting and diamond drilling. The sampling campaign is not expected to be completed before the end of 1945. Recent field work has shown that the occurrence of garnierite is much more widespread than was known two or three years ago and the belt of basic igneous rocks forming part of the Serrania del Interior is considered to be worth a more detailed study.

★The Iron Mines Co. of Venezuela, Bethlehem Steel affiliate, has continued its preparatory work for putting the El Pao iron deposits into production. After prolonged investigation of possible sites for a deep-water shipping depot on the Venezuelan coast, in the Gulf of Paria, without finding any suitable place, this company has obtained a site in Trinidad waters. On Jan. 22 the S.S. "Venore" was launched in the Baltimore shipyard of the Bethlehem Steel Co. and christened by the daughter of the Venezuelan Ambassador to the U.S. This is the first of a fleet of four ships to be built, especially designed for the transportation of iron ore from South America.

★The cinnabar property at San Jacinto, State of Lara, has been examined by W. G. Donaldson, of the H. W. Gould Co., San Francisco. This mine has been idle since the end of 1942, and the recent fall in the price of mercury makes it less likely that it will be reopened.

★Compania Anonima Minas de Amianto de Tinaquillo has started stripping operations on its quarry site, and some asbestiferous rock was broken and stored near the treatment plant.

★Alcoa's subsidiary, the Republic Mining & Manufacturing Co. Ltd., has had a party of engineers and geologists in the field since the spring of 1944. The area held under exclusive exploration permit was thoroughly examined, and it is believed that the sampling campaign yielded disappointing results. No mining concessions have been applied for. The search for bauxite has recently been extended to several other parts of the country, and Dr. W. S. McCann, consulting geologist, is now in Caracas arranging a new program of exploration for 1945. During 1944 Lawrence Litchfield, vice president of Alcoa, paid a visit and studied some of the clays produced during the sampling campaign.

★The new mining law passed by the National Congress in 1944 was published in January 1945 with the revised by-laws. Those qualified to know claim that it is an improvement on the previous law and is the simplest and most liberal of all South American mining codes.

CHILE

New contract with U.S. is disappointing—Price of gold favors cyanidation

★After long conferences between the U. S. Commercial Co., represented in Chile by S. W. Low, R. P. Miller, and W. C. Schmidt, and the Chilean delegates of the mining industry, H. Videla Lira, president of the Mining Society of Chile; O. Martinez, vice president of the

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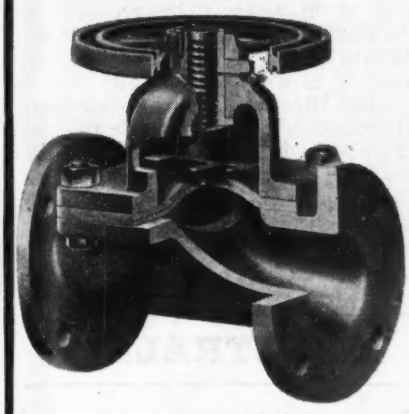

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Caja de Credito Minero; and F. Benitez, acting as technical adviser, the basis for an ore contract between the United States and Chilean governments for the purchase of all copper and copper-gold ores and concentrates has been agreed upon. The old contract expired on Jan. 31, 1945, and the new one will be good until April 30. The new conditions call for a reduction of 5 and 2.5 percent on the prices paid for copper ores and concentrates respectively. The grade of copper ore which the U. S. Commercial Co. is obliged to purchase is raised from 7 to 9 percent. No changes are made in the schedules to be paid for copper-gold ores and concentrates.

★Since the first contract was signed in February 1942, U.S. Commercial Co. has been operating on a "cost-plus" basis the two local smelters of Chagres and Naltagua, whose combined capacity is about 110,000 short tons of ore and concentrate a year. The purpose of operating these two smelters was to reduce in Chile about two-thirds of the country's production from small mines, rather then shipping it crude to the States, thus saving considerable shipping space. However, smelting costs, like all production costs in Chile, have been increasing at an alarming rate, due to inflation brought about by the war. Of the two operating smelters, Naltagua had by far the higher costs, and U.S. Commercial Co. decided to continue smelting operations only at Chagres. As a consequence, Naltagua was compelled to shut down Feb. 1.

★This smelter had been operating almost continuously for about 35 years. It belongs to a French company and was started with blast furnaces using European coke to reduce local ores from its own mines, which, in the course of time, were gradually worked out. During the last great war, when good metallurgical coke was almost impossible to obtain in Chile, both Chagres and Naltagua were modernized by Allis-Chalmers, and reverberatory furnaces were built to burn local pulverized coal of about 11,000 B.t.u. In the course of time, Naltagua became a real custom smelter, buying all classes of copper and gold ores and concentrates from as far north as the port of Coquimbo. However, the management was not careful to improve its smelting methods and to keep up with modern technique, and this reason, coupled with high freight from the railhead at El Monte, increasing costs of labor and other charges, made it impossible for Naltagua to continue operating on a strictly commercial basis when the cost plus contract was withdrawn by U.S. Commercial Co. About 600 men worked at Naltagua, including the miners employed by this company in extracting the calcareous copper ores used as a lime flux at the smelter.

★Ores and concentrates from the mines and mills in the central provinces of Chile, Santiago, Valparaiso, and Aconcagua, including those from the mill of Disputada de Las Condes, will be diverted to Chagres. It is thought that this smelter, by operating with its

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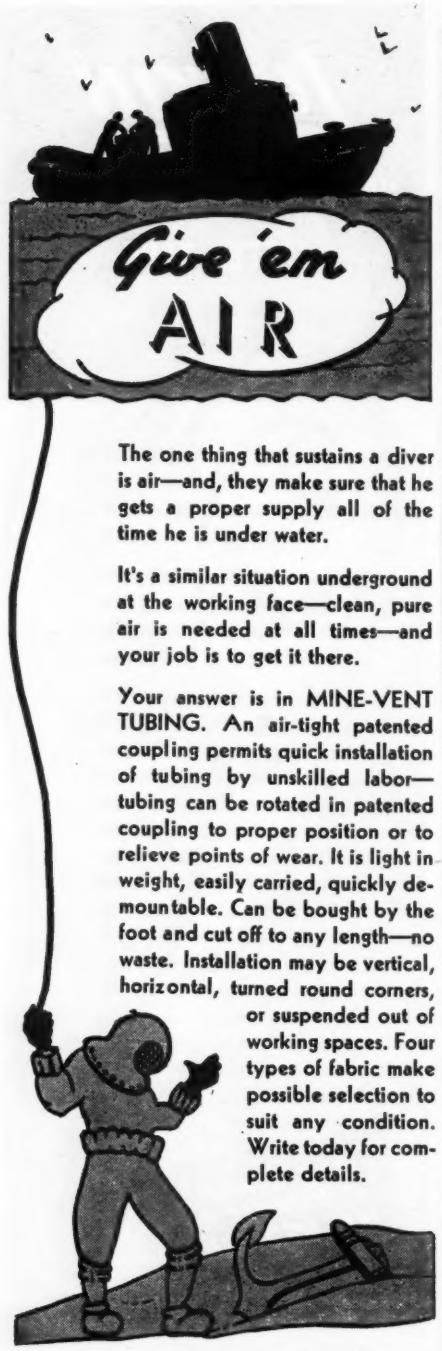

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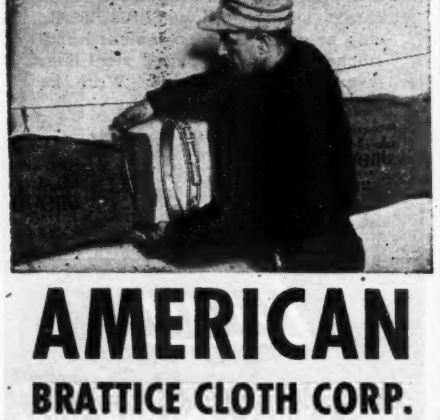

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Chile (*continued*)

two reverberatories part of the time, will be able to take the greater part of the charge formerly reduced at Naltagua.

★To say that Chilean miners were dissatisfied with the conditions of the new contract with U. S. Commercial Co. is to put it mildly. In general, the miner in Chile, both the large corporation and the little fellow, is being ground between two stones. One is fixed, or even declining, prices for its ores, and the upper, and much heavier stone, is the increasing cost of production, not only for imported supplies but also for those produced locally. In the past, when conditions such as those that now prevail have occurred, the inevitable solution has been to devaluate the currency to be able to compete in foreign markets. Now, owing to the large exports of copper and nitrates, dollars are plentiful, while imports of machinery and goods have been cut down to a minimum on account of the war.

★Owing to the much higher price obtainable for metallic gold in Chile than can be had for the same metal in ore or concentrate—about $50 per ounce for metallic gold, against about $25 to $30 in ore or concentrate—Cia. Minera Punitaqui is building a cyanide mill to treat its own concentrate. This company treats 400 tons a day of heavy or massive pyritic gold-copper-mercury ore by flotation. The cinnabar is first floated and then a differential float is made to depress the pyrite and obtain a rich chalcopyrite-gold concentrate, which will be cyanided. The residue from the cyanide mill will be again differentially floated to recover the chalcopyrite in a 25 percent copper concentrate. Cyanid consumption will be about 6.6 lb. of NaCN per ton of concentrate, a rather high figure due to the presence of so much copper. The cost of this cyanide is $1.30 per ton of concentrate. Many other companies are changing their milling practice to increase the recovery of gold in metallic form. Consequently, cyanidation and amalgamation are considerably on the increase.

★Compañia Minera Chanaral-Taltal recently started its new cyanide mill to treat the ores from the Sierra Overa district, which until recently were milled at El Salado cyanide plant of Caja de Creditor Minero. The mill, which was designed by F. Benitez, has been operating successfully and handling easily up to 65 tons per day. This company also owns a 100-ton flotation mill at El Guanaco mining camp, in Taltal, and the concentrates from El Guanaco will also be cyanided at Sierra Overa's mill.

★On account of decreasing production of all types of gold and copper ores in Chile for reasons already explained in previous numbers of *E.&M.J.*, the board of directors of Caja de Credito Minero have decided to make a careful study of the principal mining districts of northern Chile whose ores are treated in the Caja's mills. This survey will consist of geologic mapping of the principal mining camps, supplemented by detailed geological examination of the underground workings of the mines, surveying and sampling of the same, and detailed study of the mining methods employed, with a view to improving production and decreasing costs. For this purpose $5,000 (U.S.) has been appropriated for the Domeyko gold camp alone. The geologists of the Chilean Geological Survey (Departamento de Minas y Petroleo) will carry out the geological work for Caja de Credito Minero. Once the final reports are received, Caja will decide the sums to be spent in each camp to find more ore and to improve mining methods. Such work will be carried out by the miners themselves, but under strict control and supervision by Caja's engineers.

AUSTRALIA

Commonwealth mining is marked by rising costs, low production, labor shortage

WESTERN AUSTRALIA

★Gold production in 1944 decreased by 75,627 oz. compared with 1943. In 1942 the output was 832,504 oz., declining to 540,067 in 1943 and to 464,440 in 1944, whereas prior to 1940, production for a number of years exceeded 1,000,000 oz. The decrease is entirely due to the manpower restrictions imposed by the Commonwealth Government on gold mining, the high cost of stores and materials as a contributory cause for the closing down of many mines, and to the low efficiency of the limited available labor, together with the high percentage of absenteeism which cannot be checked or controlled while the labor supply is totally inadequate for requirements. A number of mines were compelled to close, or to restrict operations, by the impressment and removal of plant and machinery for government purposes, and in many cases such machinery still remains unpacked and unused. The Kalgoorlie gold field produced 57 percent of the total output, followed in order by Dundas, East Murchison, and Murchison.

★The State production will suffer a further decline with the curtailment of operations by Wiluna Gold Mines, Ltd., from February, occasioned by the fall in grade to an unprofitable level of the ore below the 2,000 level. The ultimate closing down of this great mine does not appear far distant. It is possible that the reduced scale of working may permit some labor to be diverted to the prospecting of the Mount Charlotte leases, at Kalgoorlie, held under option by the company. The attention of the Commonwealth Government has been directed to the increasing need for the diversion of labor to the gold mines in order to put them in a position for rapid reopening or increased output immediately the need arises. Already much munition work has been greatly curtailed, but the labor released has been

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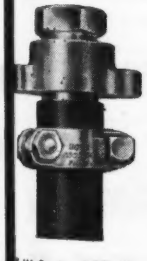

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diverted to other government enterprises and the needs of private enterprises, have been ignored. The gold-mining industry holds a position in Western Australia similar to that which it fills in South Africa. In a little more than 50 years it has produced 49,749,296 oz., valued in Australian currency at £271,286,134.

★Hill 50 Gold Mine, N.L., now the only company-worked mine on the Mount Magnet field, continued profitable operation on a reduced scale in its last financial year. It was possible to carry out little development and as a result ore reserves have further decreased, standing at 183,000 tons, with an average grade of 5.57 dwt. per ton. Costs have continued to rise during the last three years, from 35s. 1d. in 1942 to 42s. 6.25d. in 1943 and 44s. 3d. in 1944, the final year's figure containing no development. In 1944, mining and treatment costs amounted to 39s. 1.50d. and general expenses were 5s. 1.5d. The mill treated 35,771 tons of oxide, semi-oxidized, and sulphide ore having an average head value of 6.4 dwt. gold per ton, for the recovery of 11,692 oz. of bullion containing 10,083 oz. of gold. The mine contains a number of lenses of ore, six of which have been worked, and the lowest working level is No. 3. Prior to the curtailment of mining, winzes had been sunk to No. 4 level, but it was not possible to complete the sinking of the main shaft until 1943. Since then, the main crosscut has been driven to the lode, but no further development could be done owing to the labor position.

QUEENSLAND

★Golden Plateau, N.L., at Cracow, west of Rockhampton, has reported on operations for the last financial year to June 30, 1944. Ore extraction was greatly curtailed and little development was possible. Despite this, ore reserves increased slightly, notwithstanding extraction, for in stoping and in open-cut working, ore lying behind sampled limits enabled the mining of greater widths than had been estimated. Ore reserves were estimated at 115,300 tons having an average value of 4.8 dwt. gold per ton. The lode contains three large lenses of ore which attain a maximum stoping width of 35 ft. The deepest level is No. 5, which is 644 ft. from surface, and at this depth the lode appears to maintain the characteristics of the level above. Development here is incomplete and it has been impossible, because of shortage of labor, to undertake any deeper prospecting. Actually, the mine is working on one shift only, without development, and milling is confined to two shifts daily, five days per week. Operating results for the year were:

Ore milled, tons	20,640
Gold produced, oz.	4,636
Silver produced, oz.	5,704
Gold recovery, percent	93.02
Residues, assay value, gr. per ton	8.1

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Australia (*continued*)

cyanide treatment, 81.78. Operating costs per ton were:

Development	2s.	5.07d.
Ore breaking	9	0.47
Treatment	12	9.01
Gold realization, sundry and general expenses	4	9.09
Total costs	28s.	11.64d.

The company also carried out the development of wolfram lodes, some 50 miles distant, and erected a gravity treatment plant at the mine at Cracow. Lodes have been opened up over lengths of several hundred feet, but the wolfram shoots have been erratic and have rarely exceeded 18 in. in width, with values of 2 percent WO_3 and under. Treatment of this ore has recently commenced.

VICTORIA

★The most important of the few gold mines now operating in the State is A. 1. Consolidated Gold, N. L., situated at Gaffney's Creek, in a slate and sandstone belt some 60 miles long and five miles wide, intruded by numerous diorite dikes, which contain auriferous quartz reefs. The A. 1. mine was first worked in the 1860's and has been operated intermittently ever since. The last company operations commenced in 1934, and, after initial disappointing results, had several years prosperity in extracting overlooked ore in the worked levels. Simultaneously with the need to sink the shaft into virgin ground below No. 14 level, the manpower position became so serious, and the finances so depleted, that it was only with government assistance that the shaft was ultimately sunk to No 15 level, in the course of which a new reef was cut. This has proved very rich, and ore averaging 4 oz. gold per ton has been milled for many months. Despite retarded development, 3,442 tons of ore were milled in the year to Aug. 31, 1944, and 14,060 oz. of gold recovered, as well as 74 tons of pyrite concentrates containing 423 oz. of gold, total realization being £A125,320 on a capital of £A45,000.

Costs during the year, in shillings per ton, were:

Development	32.3
Mine repair and maintenance	2.3
Tool sharpening	2.6
Power and lighting	6.5
Plant repairs and maintenance	4.3
Milling	9.9
General	0.3
Holidays and bonuses	2.1
Total mine costs	60.3

NEW ZEALAND

★Gold production figures, publication of which was suspended during the earlier years of the war, have now been released. These show that the production for 1941 was 174,656 oz., valued at £1,802,277; in 1942, 165,986 oz., valued at £1,684,122; in 1943, 149,150 oz., worth £1,582,851. The output for 1944 has not been announced. Two lode mines were producing in 1943, the Martha and Blackwater, which con-

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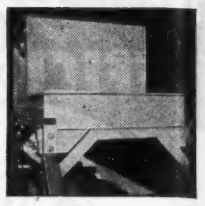

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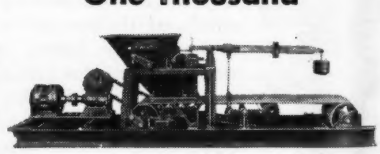

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tinued operations throughout 1944, and 18 bucket dredges. All companies are suffering seriously because of shortage of labor.

AFRICA

Rand production down in 1944—Extensive postwar development program calls for expenditure of £80,000,000

★The working profit of Witwatersrand gold mines declined in 1944 nearly £5,000,000, with the total before deduction of taxation and lease payments at £32,941,226, against £37,908,766 for 1943. Comparative results for the past two years are given in the following tabulation:

	1943	1944
Milled, tons	59,952,900	58,504,400
Yield, oz.	12,800,021	12,277,228
Yield, dwt. per ton	4.097	4.039
Working revenue	£103,585,046	£99,623,168
Per ton milled	34s. 7d.	34s. 1d.
Working costs	£65,676,280	£66,681,942
Per ton milled	21s. 11d.	22s. 10d.
Per oz.	106s. 11d.	112s. 11d.
Working profit	£37,908,766	£32,941,226
Per ton milled	12s. 8d.	11s. 3d.
Dividends	£15,322,952	£13,617,895

★On the technical side, a noteworthy feature during the past year has been the start, on the Far East Rand, of shaft-sinking operations on three elliptical shafts. Although not a new shape of shaft, the design has never found favor with engineers on this field. The past year has also seen a greatly increased use of detachable bits. The type favored, the Padley and Morgan, commonly referred to as "P & M," is a light bit, weighing about 3 oz., with a tapering fitting. It is made at the mine from slugs of 1-in. diameter steel, and practice has shown that it is economically possible to obtain two resharpenings from each bit. Reheating and forging in a sharpening machine has, however, mostly been abandoned in favor of reheating and repressing the used bit in the same press in which it was originally made.

★It is estimated that no less than £80,000,000 will be required to bring to production the new gold mines in the Union which may be opened up after the war. This postwar program is based on the assumption that there will be 16 new properties, each of which will entail an expenditure of about £4,500,000 to bring it to a milling tonnage of 100,000 per month within five to ten years from the start of operations. Actual capital for any particular mine will depend on the depth the shafts have to be sunk, together with general local conditions of the strata encountered in the course of sinking operations. The lowest estimate for a large-scale mine milling 100,000 tons per month is just under £4,000,000. The highest is for a mine of the dimensions proposed by Western Ultra Deep Levels, Ltd., an offshoot of the Anglo American Corp., which might run to some £12,000,000. Here it is expected to seek gold at depths around 12,000 ft. The greatest depth operations have reached on the Rand is approximately 8,500 ft.

★Given favorable postwar conditions, the 16 new mines which may be started are as follows: Four in the African and European areas of Orange Free State, and two more "probables"; West Wits. Group: West Driefontein, reopening of Libanon, one west of Blyvoor, and two "probables" to the west of that; Vaal Reefs, which is a subsidiary of Western Reefs; one outside Roodepoort; one in the Ultra Deep Levels, in the vicinity of Blyvoor; and on the Far East Rand, Spaarwater and West Spaarwater.

★In addition, a number of new shafts will have to be sunk on some of the producing mines, either directly for production purposes or as an aid to production in the form of improved ventilation. Some of the shafts in this category have already been commenced—for example, at Vlakfontein, Vogelstruisbult, Marievale, and Venterspost. No account has been taken in the estimated figure of capital requirements for any work on mines already producing.

★West Driefontein will be the first of what are believed to be several large offshoots of West Wits., which will transform the whole future of the Far West Rand field. But for the war, the exploitation of this rich area would have been undertaken some years ago. High values in the prospective new mine would seem to be assured, judging by the results which continue to be obtained in that "miracle mine," Blyvooruitzicht. Some of the leads in this mine are approaching the boundary of what will be eventually West Driefontein.

★Blyvooruitzicht's latest quarterly report for the period ended Dec. 31, 1944, shows remarkably high values of 71.4 dwt. over 11.7 in., equal to 835.4 in.-dwt. for a sampled footage of 5,795 ft. While again failing to maintain 100 percent payability, by under 1 percent, the values are higher than in the previous quarter. It is anticipated that as soon as a holing is made with the No. 2 shaft about the middle of the year, steps will be taken to expand the existing plant to treat 40,000 tons per month, and stoping proper will start. At present the mill is supplied with development rock only.

★Klerksdorp mining district experienced a gold boom last year, when unprecedented prospecting went on over a vast area. All Klerksdorp's producing mines reported an increase in output. The steady production of alluvial diamonds continued with the opening of several new diggings. Gold output for 1944 totaled 402,761 oz., bringing the total production during the last 55 years to 3,019,294 oz., valued at £8 8s. per ounce, or £25,362,070. Diamonds valued at £47,764 were found on the diggings during 1944.

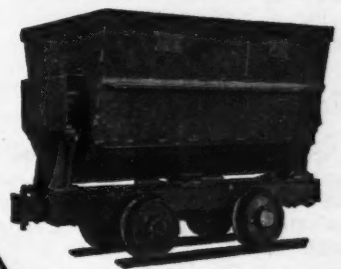
★Notable mining development during 1944 is reflected in drilling at Syfergat, 5 miles from Wolmaransstad, where, it is understood, a gold reef has been intersected, a discovery which led to a scramble for options over farms in that area.

★The first report on the borehole drilling program now being conducted by the Free State Development & Investment Corporation, in which the Johannesburg Consolidated Investment Co. is largely interested along with a number of other well-known "houses," shows good results at one depth, and hopeful prospects in at least one other. The borehole dealt with is K.K.I., on the Odendaalsrust Townlands, Farm Kalkkuil 153, which intersected the reef horizons at the following depths: At 4,253 ft., 6.4 dwt. over 20.7 in., equal to 132 in.-dwt.; at 4,421 ft., 24.8 dwt. over 12.8 in., equal to 317 in.-dwt.; at 4,777 ft., 3.5 dwt. over 10 in., equal to 35 in.-dwt.; at 4,841 ft., 7.2 dwt. over 6 in., equal to 43 in.-dwt.

★The miners of the Nchanga copper mine, Northern Rhodesia, have returned to work after being out on strike for a period of 6½ weeks. It had been decided by the management that the mine should be closed if the daily-paid employees did not return to work. An application to close the mine was made to the Governor and granted on Dec. 22. Later he met the general council of the Northern Rhodesia Mine Workers' Union, the Salaried Staff Association, and the Northern Rhodesia Mine Officials Society, and subsequently the

(*continued on p. 172*)

AN ACE IN THE HOLE



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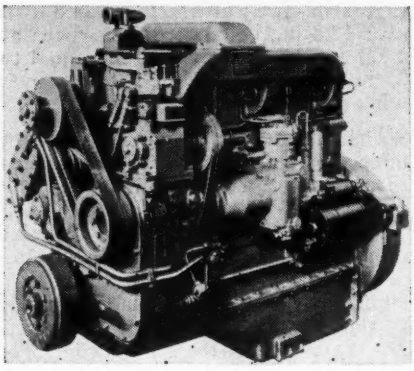
C.S. Card Iron Works Co
Denver, Colorado

EQUIPMENT NEWS

Automotive Diesel Engine

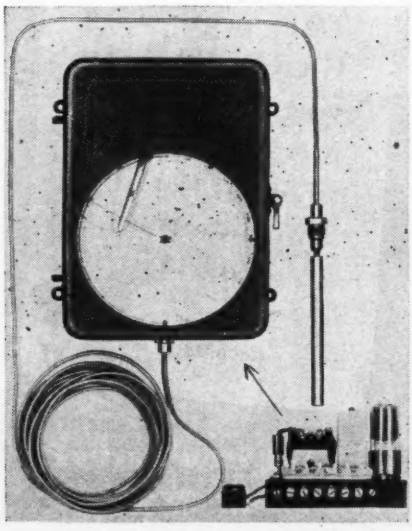
A new series of high-speed diesel engines for automotive use is announced by Cummins Engine Co., Inc., Columbus, Ind. Improved design results in additional power without appreciable increase in engine weight or dimensions. Limited numbers of the new models



have been put in service on 20- and 30-ton dump trucks on the Iron Range and in other open-pit operations in the United States and Canada. One Iron Range operator is reported to have obtained 33 round trips per eight-hour shift with trucks powered by the new engine, as against 22 round trips using the older model.

Electronic Controller

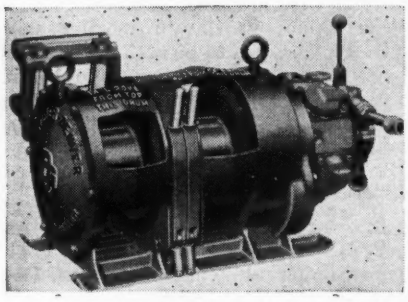
Recording and indicating models for the automatic control of temperature, pressure, liquid level, and humidity are announced by the Bristol Company, Waterbury 91, Conn. The new line operates on the shielding effect of a vane passing between two coils in an electronic circuit. For temperature control



in electric-, oil- or gas-fired, and steam-heated industrial equipment, the controller has a range of −125 to 1,000 deg. F. Pressure control is available in ranges from full vacuum to 6,000 lb. per sq.in.; also for controlling liquid level. The humidity controller operates from a wet and dry bulb type of element with separate control for each bulb. The device is also recommended as a time-program controller for automatic operation of any of the controls on a definite time schedule.

Air-Powered Scraper Hoist

Powered by a five-cylinder radial air motor that provides high torque at all speeds, a new line of slusher or scraper hoists is announced by the Gardner-Denver Co., Quincy, Ill. Exceptional power combined with compact design permits handling of heavier loads. The hoist is operated by a single throttle lever which returns automatically to neutral when released. A roller clutch



engages one drum and automatically releases the other when the throttle is reversed. The compact design and light weight of these hoists makes it convenient to move them into stopes through small raises and chutes.

INDUSTRIAL NOTES

Union Engineering Co., Los Angeles 13, Calif., has been organized to engage in mining and metallurgical work. **B. M. Snyder** is manager. Associated with him are **D. B. Pushkin,** metallurgical engineer, and **L. B. Eaton,** mechanical engineer. Consultants are **Edward Thornton** on mine management; **George Crerar** on non-ferrous metallurgy; and **John Allingham** on chemical engineering.

Dale Higgins, representative for the **Marion Steam Shovel Co.** in the Pittsburg, Kan., territory, died recently at his home in Pittsburg.

Ohio Brass Co., Mansfield, Ohio, announces the removal of its San Francisco office to 1503 Hobart Bldg., 582 Market St., San Francisco 4, Calif. The office is under the direction of **A. M. Bohnert.**

Lucius Pitkin, Inc., metallurgical chemists and engineers, New York 7, N.Y., announce that **Frederic H. Wright,** until recently supervising engineer of the secondary metals section of the U. S. Bureau of Mines, has joined the organization as assistant to the president.

C. C. Bray has been made assistant manager of the Worm Gear Division of **DeLaval Steam Turbine Co.,** Trenton, N.J.

Wickwire Spencer Steel Co., New York 18, N.Y., has announced the appointment of **A. S. Rairden** as sales manager of the company's wire-rope division.

John J. Yezbak has been appointed manager of public relations and of the news bureau of **Timkin Roller Bearing Co.,** Canton, Ohio.

Western Machinery Co., San Francisco 7, Calif., announces the appointments of **S. R. Bousman** as manager of the development department, and **A. J. Saarinen** as chief mechanical engineer.

Gardner-Denver Co., Quincy, Ill., has established the main office of its export department in the Woolworth Bldg., New York City, headed by **G. V. Leece,** vice president. Associated with him are **S. T. Brown,** assistant manager, and **Harold Weber,** assistant sales manager. **Edward Church** will be associated with the export division in the Denver office, and **C. E. Kaiser** will be in charge of the export division in Quincy.

Army-Navy "E" awards for excellence in production have been given to **Chase Brass & Copper Co.,** Waterbury, Conn. (6th); **Cochrane Corp.,** Philadelphia, Pa. (3d); **Inca Manufacturing Division of the Phelps Dodge Copper Corp.,** Fort Wayne, Ind. (5th); **American Steel & Wire Co.,** Worcester, Mass. (4th), **Sterling Engine Co.,** Buffalo, N. Y. (4th.).

BULLETINS

Lock Nut. Illustrated folder containing threading data on the "Flexloc" nut of Standard Pressed Steel Co., Jenkintown, Pa.

Belt Dressing. Bulletin of the B. F. Goodrich Co., Akron, Ohio, containing directions for applying dressing for natural rubber belts to belting made with synthetic rubber.

Beryllium Alloys. A brochure on their characteristics and uses. Beryllium Corp. of Pennsylvania, Reading, Pa.

Filter Presses. T. Shriver & Co., Inc., Harrison, N.J., has published an informative booklet on selection and application of filter presses. Ask for Cat. No. 45.

Welding Clothing. American Optical Co., Southbridge, Mass., announces a new booklet describing safety clothing for male welders.

Water Softeners. Cochrane Corp., Philadelphia 32, Pa., has made available an informative booklet on greensand zeolite softeners. Ask for Publication 2860-A.

PHILCO

gives you the latest in Modern Mine Battery Design!

HUNDREDS of mine locomotives and shuttle cars are now hauling more tons at lower cost because of the advanced research of Philco engineers in developing tougher, more powerful storage batteries. Philco long has led in providing batteries of maximum capacity, with the rugged long-life construction especially engineered for today's heavier work schedules. Now Philco engineering leadership is demonstrated anew with the mine battery that gives 30% longer life—the great new Philco "Thirty"! For less maintenance, reduced depreciation and lower cost of all battery-powered haulage equipment investigate the new Philco "Thirty" Mine Storage Battery. It is now available in preferred types. Complete information will gladly be sent on request. Philco Corporation, *Storage Battery Division,* Trenton 7, New Jersey.

For 50 years a leader in Mine Storage Battery Development

The new Philco "Thirty" with 30% longer life is identified by its distinctive red connectors.

Africa (*cont. from p. 169*)

general council of the union held a ballot, which favored a return to work. A proposal by the Union to amend the agreement entered into only five months ago was rejected.

★The gold output of Southern Rhodesia in November was 47,985 oz. and fell below the October output by 988 oz. There was, however, a further increase in the base mineral output, and for the first time the value of one month's production exceeded £300,000. This improvement in base minerals caused the total value of the mineral output to be £3,384 better than in October. For the 11 months of the year 543,208 oz. of gold were produced. This was a decrease of 61,719 oz. compared with the same period of last year. The base-mineral output for the same period was valued at £3,147,554, which was better than the 1943 output of £100,669. The improvement in base minerals was not large enough to counterbalance the fall in gold production, and the total mineral output for the 11 months was valued at £7,719,793, which was £419,281 less than the figure for last year.

★Working costs of Witwatersrand gold mines averaged 23s. a ton in November, the highest figure of 1944, except February, when operations were adversely affected by flood water. Per fine ounce of gold produced, the average cost was 113s.5d., a level which was exceeded only in February and March. Of 47 companies in the Witwatersrand only seven showed costs of production per fine ounce at less than 100s., the two lowest returns being 54s. 8d. for East Geduld (16s. per ton milled) and 63s. 4d. for Sub-Nigel (34s. 6d. per ton milled). The highest returns were those of Van Dyk, 167s. 5d., Van Ryn Estate 165s. 7d., and Geldenhuis Deep 162s. 11d. Average recovery per ton milled is showing a tendency to rise. It was 4.051 dwt. in November, compared with 4.024 dwt. in October and the record low of 3.997 dwt. in July.

Wartime Mineral Output in Canada

(*continued from p. 104*)

Nickel as Canada's second largest mining enterprise, with Noranda holding third place. Smelters account for about 95 percent of lead recovery in the Dominion and more than 50 percent of the zinc, with output sold in 1943 valued at $56,000,000, compared with $28,000,000 in the prewar year 1938.

Mineral output in the Maritime Provinces was mainly coal.

Continuing the downward trend that started in 1943, mineral output in Canada registered a further decline estimated at 8.6 percent in 1944, when production was valued at $482,260,463, compared with $527,946,462 in 1943, the latter being lower than 1942 by 7 percent. Maximum output of $566,768,672 was attained in 1942. The 15 percent advance in the value of war minerals in 1943 largely offset the 24.5 percent decline in gold, which was substantially higher than the 9.6 percent reduction in 1942 and in line with the continued drop that took place in 1944.

Recovered largely from properties developed under the urgency of war, output of the following items was higher in 1943, but failed to maintain the productive rate in 1944: copper, nickel, lead, zinc, iron ore, manganese, molybdenite, and titanium. This group, with other strategic minerals, was valued at $7,079,350 in 1943, for a 67 percent advance over 1942.

In the first eight months of 1944, lead declined 37 percent, gold was 22 percent lower, and zinc was down 16 percent, increases being confined to iron ore, gypsum, clay products, and natural gas; the major decline was in asbestos. Gold recovery, attaining maximum value in 1940 at $204,479,083, declined in 1942 to $186,390,281 and in 1943 to $140,575,088. The 1944 gold output was worth about $109,650,000.

Labor shortages have been recognized since 1942 as the major problem of Canadian mining. In the first quarter of that year there were about 27,020 men on gold mine payrolls; in October 1942, the number had been cut to 16,058. That period marked a reduction in mine payrolls from 119 to 111, according to the Canadian Bank of Commerce index (1937 = 100). Mine payrolls reached the maximum index figure of 133 in October 1941. In subsequent years low points were recorded, as follows: 105 in June 1942; 97 in August 1943; 103 in both January and October 1944. Fall and winter employment records in 1944 reversed the course in previous years, as indicated by the following table:

Mine Payrolls 1942–1944

	Jan.	*Mar.*	*Aug.*	*Sept.*	*Oct.*
1942...	122	116	109	107	111
1943...	106	106	97	100	109
1944...	103	113	106	109	103

In meeting the critical manpower problem, mine management has been active in employing and training women, boys over 14, and unskilled men. Since 1939, organized labor in Canada has increased more than 85 percent; union membership in June 1944 stood at 664,533, including 199,487 employed by the metals industry, out of a total of 5,016,000 gainfully employed, representing an employed percentage of 56.5. Joint action by management and labor in the solution of training problems has made it possible to continue mineral production essential to the war effort.

The Bank of Canada reports an increase of 21.8 percent in wage rates for metal miners, compared with a 10 percent increase in the price of gold. Metal prices have remained unchanged since 1939 in accordance with the British Ministry of Supply agreements. The wage rate index, representing a five-year period, is as follows:

1939,—102.9; 1941,—113.2;
1943,—125.3

Scarcity of miners was given as the cause of shutdowns at 9 gold mines in Ontario in 1943 and 8 in 1942; 2 gold mines in Quebec in 1943 and 1 in 1942; 1 gold mine in Manitoba in 1943 and 1 in 1942; 2 gold mines in Nova Scotia in 1943; 2 gold mines in Northwest Territories in 1943 and 3 in 1942; 1 gold mine in Saskatchewan in 1942; 2 gold mines in British Columbia in 1943 and 14 in 1942, for a total of 46 mines closed. Additional mines stopped work in 1944, many of them for a period of only a few months in order to enable curtailed crews to concentrate on essential development. At such time as labor again becomes available it will be required to concentrate on exploration and rebuilding ore reserves, indicating a prolonged transition period following restrictions.

The first Canadian contract for copper to be terminated by Metals Reserve Co., effective Dec. 31, 1943, was with Granby Consolidated. All other Canadian contracts held by Metals Reserve are grouped under a master agreement that continues in effect for several years, subject under certain conditions to termination within three months.

Postwar plans for the mining industry have been centered in reviving gold output, and in concentrating on exploratory and development work in the formerly inaccessible areas of Labrador, Northwest Territories, northern Manitoba and Quebec. The indicated further decline in base-metal recovery will be added to the problem of disposing of surplus stocks. Conversion to peacetime levels gives promise of establishing active camps in several newly explored potential mining fields as well as expanding those areas where production has been established. Increased output will serve as an important source of employment and will supply essential materials for export. In these respects, mining is regarded as one of the important factors of the national economy in stabilizing the postwar period in Canada.